Pure wafer
Wafer Reclaim – Prescott, Arizona

June 6, 2022

ATTN: Air Quality Division
ADEQ
1110 West Washington Street
Phoenix, AZ 85007

Re: Renewal Application for Class II Air Quality Control Permit No. 66477
Place ID: 115968

In accordance with AAC R18-2-304.C.2, attached is the Pure Wafer Inc Application Packet for Renewal of our Class II Air Quality Control Permit No. 66477 expiring on November 2, 2022.

This Application Packet for Renewal was due May 2, 2022, to be considered a timely application. We will submit a permit deviation report with the next semiannual compliance certification to document the failure to submit an application at least 6 months prior to the expiration date as required by Condition I.B of Attachment "A" of the current permit with the next semiannual compliance certification.

Attached is the change of responsible official form, changing responsible official from Robert Cornell to Mark A Moulton.

Please contact me at (928) 771-8900 ext 571 or Troy Christensen, PE, Managing Principal with Otis Institute at 415-734-0186 or troy@otisinstitute.com, if you have any additional questions regarding our application.

Sincerely,

Mark A. Moulton
Quality Systems Manager
Tel: 928-771-8900 X 571
Fax: 927-771-8901
Cell: 602-320-1898
mark.moulton@purewafer.com

Date: 06/04/2022

Arizona Department of Environmental Quality
Air Permits Unit
1110 West Washington Street
Phoenix, AZ 85007

Subject: Responsible Official for Air Quality Permit # 66477

This letter is to request a change of the Primary Responsible Official for the above referenced permit. I, Mark Moulton, will assume the role as the Primary Responsible Official for certification of all reports submitted to ADEQ in accordance with our operating permit pursuant to AAC R18-2-301.17. I will replace the current Primary Responsible Official, Robert Cornell.

My mailing address is as follows:

Name: Mark Moulton

Address: 2575 Melville Drive

City: Prescott, State: AZ Zip: 86301

Phone: 928-771-8900 X 571 Email: mark.moulton@purewafer.com

Sincerely,

Signature of Responsible Official

Title: Quality Systems Manager

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Sincerely,

Signature of Responsible Official

Title: Quality Systems Manager

APPLICATION PACKET
FOR
CLASS II PERMIT RENEWAL

Purewafer
Wafer Reclaim – Prescott, Arizona

Arizona Department of Environmental Quality

Air Quality Division

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Air Quality Division

1110 West Washington • Phoenix, AZ 85007 • Phone: (602) 771-2338

STANDARD CLASS II PERMIT APPLICATION FORM

(As required by A.R.S. § 49-426, and Chapter 2, Article 3, Arizona Administrative Code)

1. Permit to be issued to (Business license name of organization that is to receive permit):

   Pure Wafer Inc

2. Mailing Address: 2575 Melville Road

   City: Prescott State: AZ ZIP: 86301

3. Name (or names) of Responsible Official: Mark Borowicz - CEO

   Phone: 408-945-8112 x 352 Fax: 408-945-0756 Email: mark.borowicz@purewafer.com

4. Facility Manager/Contact Person and Title: Mark A Moulton

   Phone: 928-771-8900 x 571 Fax: 928-771-8901 Email: mark.moulton@purewafer.com

5. Facility Name: Pure Wafer - AZ

   Facility Location/Address (Current/Proposed): 2575 Melville Road

   City: Prescott County: Yavapai ZIP: 86301

   Indian Reservation (if applicable, which one): NA

   Latitude/Longitude, Elevation: 34deg 30min 23.1sec N / 112deg 24 min 39.1sec / 4961 feet ASL

6. General Nature of Business: Silicon wafer reclamation

7. Type of Organization:

   X Corporation ☐ Individual Owner ☐ Partnership ☐ Government Entity ☐ LLC

   ☐ Other

8. Permit Application Basis: ☐ New Source ☐ Revision X Renewal of Existing Permit

   For renewal or modification, include existing permit number (and exp. date): No. 66477 Exp 11/2/2022

   Date of Commencement of Construction or Modification: NA

   Primary Standard Industrial Classification Code: 3679

9. I certify that I have knowledge of the facts herein set forth, that the same are true, accurate and complete to the best of my knowledge and belief, and that all information not identified by me as confidential in nature shall be treated by ADEQ as public record. I also attest that I am in compliance with the applicable requirements of the Permit and will continue to comply with such requirements and any future requirements that become effective during the life of the Permit. I will present a certification of compliance to ADEQ no less than annually and more frequently if specified by ADEQ. I further state that I will assume responsibility for the construction, modification, or operation of the source in accordance with Arizona Administrative Code, Title 18, Chapter 2 and any permit issued thereof.

   Signature of Responsible Official:

   Printed Name of Signer/Official Title: Mark Borowicz / CEO

   Date: 06/06/2022 Telephone Number: 408-945-8112 x 352

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

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   Signature of Responsible Official:

   Printed Name of Signer/Official Title: Mark Borowicz / CEO

   Date: Telephone Number: 408-945-8112 x 352

Equipment List

Type of Equipment	Maximum Rated Capacity	Make	Model	Serial Number	Date of Manufacture	Equipment ID Number
Fume Scrubber	12,000 cfm	WESCO	H55-4QM FRP	01981200055H	1998	SC-1
Fume Scrubber	2000 cfm	Harrington/Viron (used)	ECH 2 3-5 LB	S-012899-1	1999	SC-2
Fume Scrubber	8500 cfm	Harrington/Viron (used)	VCB-1127-BD-FRP	11460	1996	SC-3
Water Heating Boiler	1919 BTU/hr	Raypak Boiler	H7-2005A	1310365652	2013	B-1
Emergency Generator	250HP@1800rpm	Detroit Diesel	GA250 / 7.6L / Series 40	WG1308N1082857	1997	EDG-1

All relevant equipment utilized at the facility should be included in the equipment list. Please complete all fields.
The date of manufacture must be included in order to determine applicability of regulations.
Indicate the units (tons/hour, horsepower, etc.) when recording the maximum rated capacity.
Make additional copies of this form if necessary.

EMISSION SOURCE FORM

					USE THIS SECTION FOR MODIFICATIONS ONLY		
Emission Point		Regulated Air Pollutant Name	PTE		PTE AFTER MODIFICATION		CHANGE IN PTE
Number	Name		lbs/hr	tons/yr	lbs/hr	tons/yr	tons/yr
1	SC-1	Fluoride	2.12	9.28			
2	SC-2	*[Ammonia]*	3.49	15.32			
3	SC-3	Fluoride	1.62	7.08			

EMISSION SOURCE FORM

					USE THIS SECTION FOR MODIFICATIONS ONLY		
Emission Point		Regulated Air Pollutant Name	PTE		PTE AFTER MODIFICATION		CHANGE IN PTE
Number	Name		lbs/hr	tons/yr	lbs/hr	tons/yr	tons/yr
4	B-1	$PM_{10/2.5}$	0.014	0.063			
		SO_2	0.001	0.005			
		NOx	0.188	0.824			
		CO	0.157	0.689			
		VOC	0.010	0.045			
		HAP	0.004	0.016			

EMISSION SOURCE FORM

					USE THIS SECTION FOR MODIFICATIONS ONLY		
Emission Point		Regulated Air Pollutant Name	PTE		PTE AFTER MODIFICATION		CHANGE IN PTE
Number	Name		lbs/hr	tons/yr	lbs/hr	tons/yr	tons/yr
5	EDG-1	$PM_{10/2.5}$	0.550	0.138			
		SO_2	0.525	0.131			
		NOx	7.750	1.938			
		CO	1.675	0.419			
		VOC	0.625	0.156			
		HAP	0.011	0.003			

APPENDIX

A. A detailed description of each process at the facility;

- A flow diagram for all processes;

B. Emissions Calculations

1. New Sources

   Emission calculations for new sources shall include:

   a. A detailed breakdown of emissions from each process.

   b. The facility-wide ***Potential to Emit*** for ***criteria pollutants*** and hazardous air pollutants

2. Emissions shall be expressed in pounds per hour and tons per year.

3. Emission factors must be clearly documented.

   - If manufacturer specifications or site-specific testing is being utilized to develop the emission factors, appropriate documentation should be provided.

4. An electronic copy of the emission calculations should be included in the application.

C. Minor NSR Applicability Determination

If a new stationary source has the ***Potential to Emit*** of a ***regulated minor NSR pollutant***, or a modified source has an increase in the ***Potential to Emit*** of a ***regulated minor NSR pollutant***, greater than or equal to the ***permitting exemption threshold***, then that ***regulated minor NSR pollutant*** is subject to minor NSR requirements. In that event, the applicant must either:

a. Elect to have the Director perform a screening model of its emissions; or

b. Implement ***Reasonably Available Control Technology (RACT)***.

A detailed explanation on how to select ***RACT*** can be found in the Department's Minor NSR Guidance document available online at:

http://www.azdeq.gov/environ/air/permits/permitapplications.html

D. A listing of all insignificant activities.

E. A comprehensive equipment list which includes the make, model, serial number, equipment identification (ID) number, and date of manufacture of all process and control equipment (equipment other than those identified as insignificant activities). The date of manufacture must be included in order to determine applicability of regulations.

Class II Air Quality Permit Renewal Application

1.0 Background

Pure Wafer Inc is a worldwide silicon wafer reclaim provider who services the semiconductor industry. These services enable semiconductor manufacturers to gain further efficiencies through the increased re-use of silicon test wafers within their production processes.

This facility began operations at this Prescott, AZ location in 1998 under the name Exsil Corporation and Laporte Electronics Chemicals Plc. This facility operated under the Exsil name until being purchased by Pure Wafer Ltd in 2007. Pure Wafer Inc is incorporated in the state of Delaware, and is registered with the Arizona Corporation Commission (ACC).

The facility houses a number of batch type wafer processing baths/basins, one heating boiler and one diesel emergency generator.

Since the opening of this facility, Pure Wafer Inc has sought out ways to reduce the usage of chemicals containing regulated air pollutants. Over the years we have implemented innovations which have eliminated the use of one strong acid blend, reduced process temperatures and reduced process chemical concentrations. Thru these efforts, in combination with changes in facility equipment and operations, we continued to manage our air emissions and in some cases, we have been able to reduce air emissions of specific species - an example of this would be Hydrofluoric Acid air emissions.

All original Environmental and Air Permitting evaluations, for this facility, were performed by Dames & Moore Engineering Services and were submitted under the name of Laporte Electronics Chemicals and Exsil Corporation. All air emissions calculations contained in this report have been conducted in a manor consistent with the calculation conducted during the 1998 Evaluation and as outlined by ADEQ guidelines “Air Dispersion Modeling Guidelines for Arizona Air Quality Permits” December 2004 edition.

2.0 Facility Processes

There are four types of air emissions sources [AAC R18-2-101.99] at the Pure Wafer - Prescott facility:

2.1 Wafer Processing Baths

The facility has several wafer processing baths containing either acid or base solutions, from which fume hood exhaust is vented to wetted-media fume scrubbers. The System information for these sources is given in **Figure 2.1-1 thru 2.1-4** and **Table 2.1-1**.

2.2 Natural-Gas Fired Heating Boiler

The facility has one primary natural gas fired heating boiler, having 1.919M BTU/hr gross input capacity, used for process and space heating. The System information for this source is given in **Figure 2.2-1** and **Table 2.2-1**.

2.3 Diesel Emergency Generator

The facility has one diesel emergency generator, having a 250 HP rating, used for lighting and equipment safe shutdown. The System information for this source is given in **Figure 2.3-1** and **Table 2.3-1**.

2.4 Misc Process Equipment Vents

In order to prevent any undesired environmental emissions, the following miscellaneous process equipment is vented to an exhaust duct connected to a Fume Scrubber as shown in **Figures 2.1-2 thru 2.1-4**.

(a) Chemical Dispense Cabinets
Enclosed cabinet is vented to maintain a negative pressure in the event of leakage.

(b) HF Concentrate Holding Tank
Holding tank after chemical bench (S&E, PWC, SPEC, FCD) draining of HF baths prior to drumming for off-site disposal. Tank is vented to maintain a negative pressure to prevent emission of HF vapors to plant environment.

(c) HF Dilute Holding Tank
Holding tank for rinses after chemical bench (S&E, PWC, SPEC, FCD) draining of HF baths. Tank is vented to maintain a negative pressure to prevent emission of possible HF vapors to plant environment.

(d) Sulfuric Holding Tank
Holding tank after chemical bench (S&E) draining of sulfuric baths. Tank is vented to atmosphere. Tank is then processed into the Acid Waste Neutralization System prior to wastewater discharge.

(e) Sodium Hydroxide Holding Tank

Holding tank after chemical bench (S&E) draining of sodium hydroxide baths. Tank is vented to atmosphere. Chemical then processed into the Acid Waste Neutralization System to neutralize acids (thereby obtaining proper discharge pH) prior to wastewater discharge.

(f) CMP Polisher Bench #1

Enclosed polishing bench is vented to maintain a negative pressure to reduce particle contamination of product.

(g) Spin Rinse Dryers

Rinse and dry wafers after chemical bench cleaning by spinning. Wafers are rinsed with DI Water and spun dry. Vented to maintain a negative pressure to reduce particle contamination of product and facilitate drying.

(h) Wafer Scrubbers

Final cleaning of particles by scrubbing. Wafers are cleaned using a solution of EDTA and NH_4OH (ammonia). Vented to maintain a negative pressure to reduce particle contamination of product.

(i) ICP-MS

Enclosed analysis tool is vented to maintain a negative pressure to reduce particle contamination of product.

3.0 Emission Calculations

The criteria used by the ADEQ to determine if a predicted ambient air impact is acceptable is the published AAAQG.

Pollutants on the AAAQG list used at Pure Wafer are Ammonia (Ammonium Hydroxide), Hydrochloric Acid, Hydrofluoric Acid, Nitric Acid and Potassium Hydroxide, and are listed in **Table 3.0-1**.

A comparison of predicted maximum off-site concentrations of chemical fume species, and the corresponding AAAQG values is shown in **Table 3.1-2**.

These values were generated using the EPA Screen 3 model. Based on this analysis, the predicted concentrations of all acid species are below the AAAQG values.

The Screen 3 model provides 1-hr average ground level concentrations.

To estimate the corresponding 24-hr values, a standard correlation factor of 0.4 (provided by the U.S. EPA) was applied. The Predicted 24-hr concentrations are 40% of the 1-hr values.

3.1 Wafer Processing Baths

To assess air emissions, a mass transfer model describing emissions of volatile solute species was used. To ensure the accuracy and consistency of the model, calculations and assumptions used by Dames and Moore during the 1998 evaluation were used for the Air Dispersion Modeling.

Further explanation of these calculations can be found in the "Air Quality Permitting Evaluation" section 2.2.1 (Reference 2) conducted for Exsil Wafer Reclamation Facility in 1997, and in **Attachment 3.1-1** of this Appendix.

3.1.1 Ammonia Hydroxide Emission Rates

Table 3.1-2 shows the comparison between modeled NH_3 concentrations and the AAAQG for all ammonia processes at Pure Wafer Inc.

Based on the conservative Screen 3 modeling **(Attachment 3.1-2 and -3)**, the calculated uncontrolled ammonia emissions yield concentration of 126 $\mu g/m^3$, is below the AAAQG 24-hr average time.

These emissions are reduced by 75% thru the use of wet-media fume scrubbing.

3.1.2 Acid Emission Rates

To ensure that current process conditions do not result in unacceptable impacts, a similar modeling methodology was used to assess maximum ground level concentrations for the acids used at the facility. The same liquid surface mass transfer model **(Attachment 3.1-1)** was used as for ammonia evaluation, based on the in-use concentration and bath temperature.

Table 3.1-1 show the emissions rate estimates for the acids, on an uncontrolled basis and with 75% control **(Sec 3.4)**. The uncontrolled fume emission rates range from 3.74 lb/hr for HF, down to 0.008 lb/hr for H_2SO_4. *Several assumptions regarding the mass transfer model **(Attachment 3.1-1)** tend to provide conservative over-estimates of the actual emission rates.*

Using the conservative Screen 3 modeling **(Attachments 3.1-4 thru -10)** – and the more conservative 3.84 lb/hr HF emission rate (*initial Permit emission value*) - the uncontrolled acid emissions yield concentrations are all below the AAAQG 24-hr average time values (**Table 3.1-2**). *For comparison, the controlled acid emissions are also provided.*

3.1.2.1 Federally Designated Hazardous Air Pollutants (HAP)

HF and HCl are also federally designated hazardous air pollutants (HAP) a major-source Class I permit would be required if the potential to emit, with controls, exceeds 10 ton per year (tpy) for any individual HAP, and 25 tpy combined. Potential to emit is determined assuming maximum emissions for a 24 hours/day, 365 days/year.

Using a conservative 75% control wet-media scrubbing efficiency **(Sec 3.4)** and **Table 3.1-1**, the potential HF and HCl controlled emissions are below the major-source Class I permitting thresholds.

	Emission Rate w/ controls (lb/hr)	Annual Emissions (tpy)	Class I Threshold (tpy)
HF	**0.934**	**4.09**	**> 10**
HCl	**0.244**	**1.07**	**> 10**
Combined		**5.16**	**> 25**

AAC R18-2-302.B.2.a.iii states that a Class II permit shall be required for "Any source that emits or has the potential to emit, without controls, significant quantities of regulated air pollutants".

According to AAC R18-2-101(106), the significant level of fluorides is 3 tpy.

The potential HF emission rate of 3.74 lb/hr **(Table 3.1-1)** without controls yields an annual emission of 16.36 tpy, which is above the significant-source Class II permitting threshold of 3 tpy.

3.2 Natural-Gas Fired Heating Boiler

Air emissions from this unit, although quantified, are below the de minimis level [AAC R18-2-302.B.2.a.v]. The Emissions information for this source is listed in **Table 3.2-1**.

3.3 Diesel Emergency Generator

Air emissions from this unit, although quantified, are an "Insignificant Activity" [AAC R18-2-101.57.h], and are below the de minimis level [AAC R18-2-302.B.2.a.iv]. The Emissions information for this source is listed in **Table 3.3-1**.

3.4 Fume Collection and Scrubber System

Based on the 1998 Dames & Moore engineering evaluation of the use of new scrubber packing media - Lantac Products LANPAC, the exhaust fume scrubbers have a removal efficiency of greater than 90%.

Although the original LANPAC packing media has been replaced by an even higher removal efficiency Q-PAC media, a value of 75% conservatively is used in the calculations.

Performance Testing indicates that the actual fume scrubber media removal rate is > 99%.

3.5 Volatile Organic Compounds

No VOCs are used or generated in the Wafer Processing Baths.

VOCs are generated by our building hot water heating boiler and emergency diesel generator. This information is provided on the "Emissions Source" forms for Point #4 and #5, and **Table 3.2-1** and **Table 3.3-1**.

References

(1) Dames and Moore, “Phase 1 Site Assessment” (1997)

(2) Dames and Moore, “Final Report - Air Quality Permitting Evaluation” (1997)

(3) Site status update letter to ADEQ (1999) [Dames and Moore, Air Permitting Update to Exsil (1998)]

(4) ADEQ Air Dispersion Modeling Guidelines for Arizona Air Quality Permits

(5) Perry’s Table 3-16,64,68

(6) Chemical Engineers Handbook 3-14, 16, 20, 23

(7) ADEQ Year 2009 Air Emissions Inventory Guidance Document

(8) U.S. Screen 3 Model

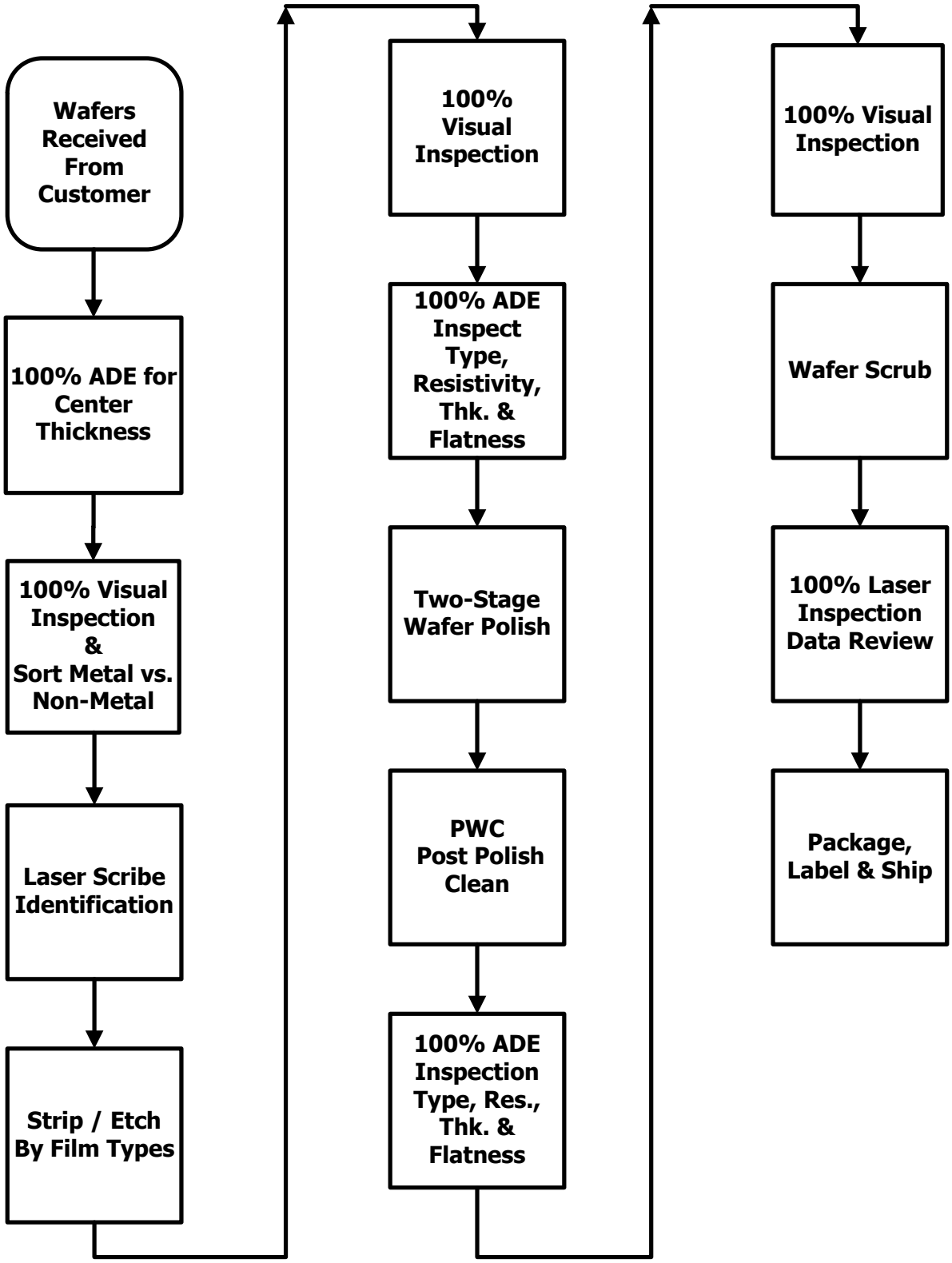
(9) LaRoche Industries Aqua Ammonia Information Manual

(10) Honeywell Hydrofluoric Acid Properties (Attachment 3.1.2a)

(11) Semiconductor Industries Wafer Fab Exhaust Management (Attachment 3.1.2b)

Figures

Figure 2.1-1 Silicon Wafer Reclaim Process Diagram



Class II Air Quality Permit Renewal Application

Figure 2.1-2 Fume Scrubber #1 Effluent Diagram

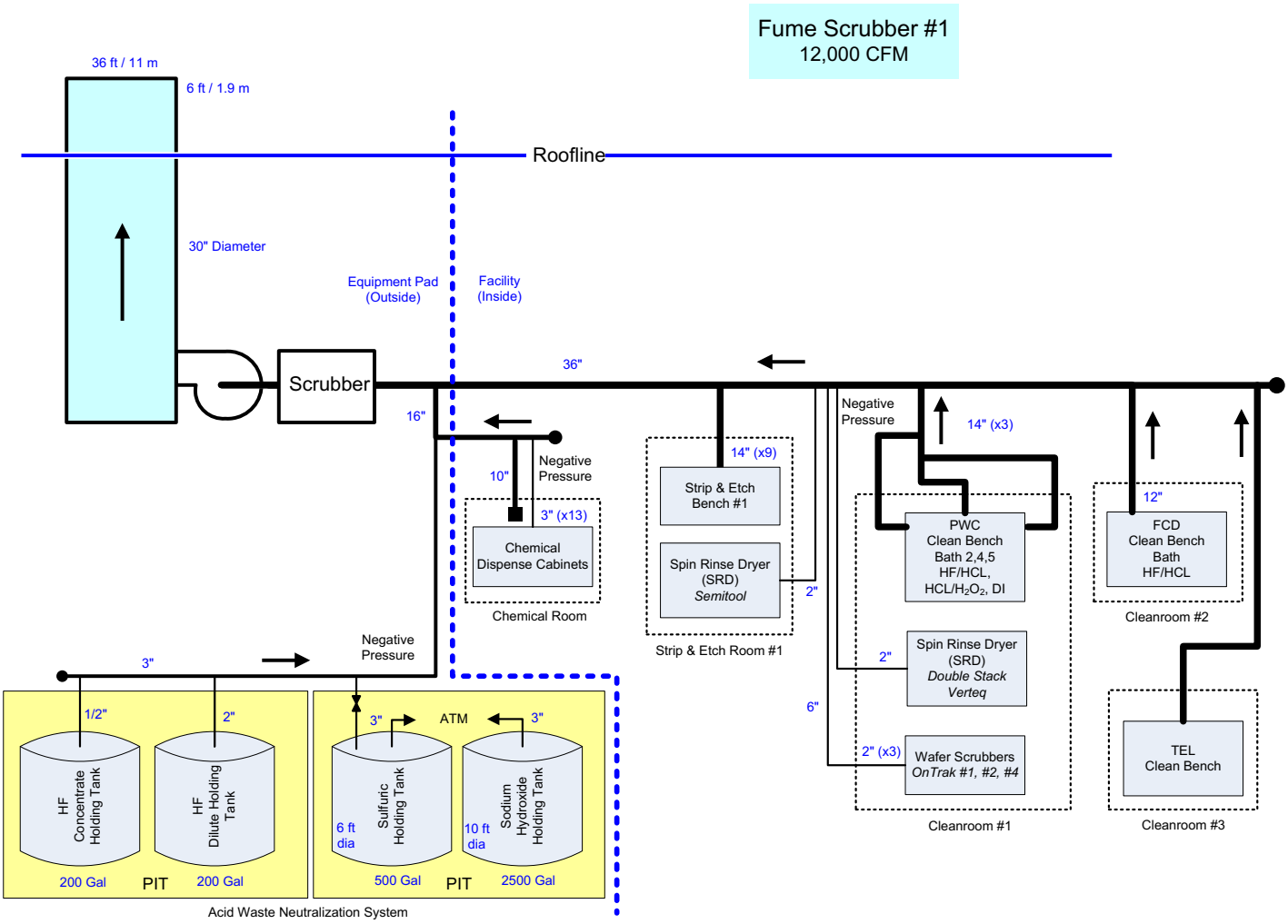


Figure 2.1-3 Fume Scrubber #2 Effluent Diagram

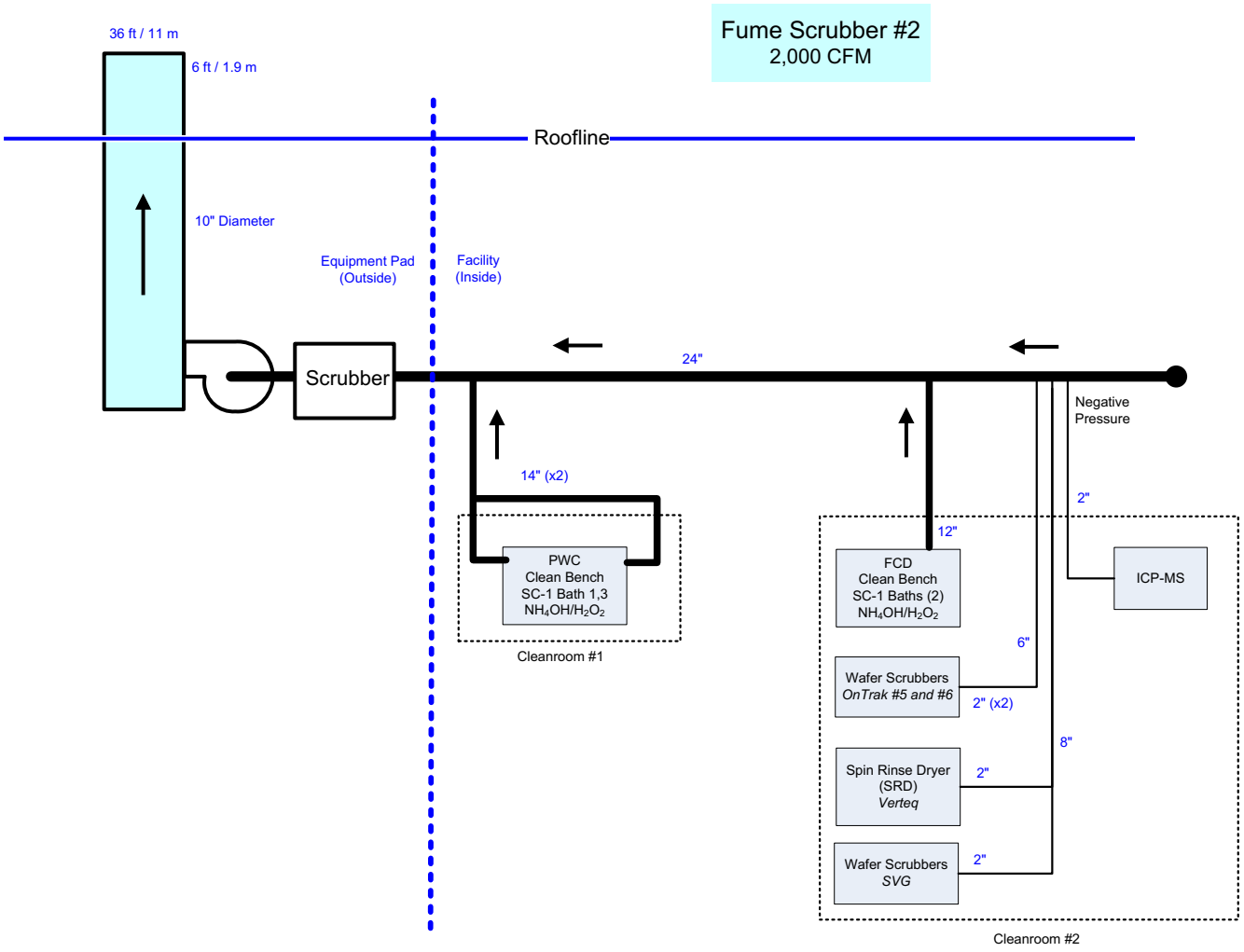


Figure 2.1-4 Fume Scrubber #3 Effluent Diagram

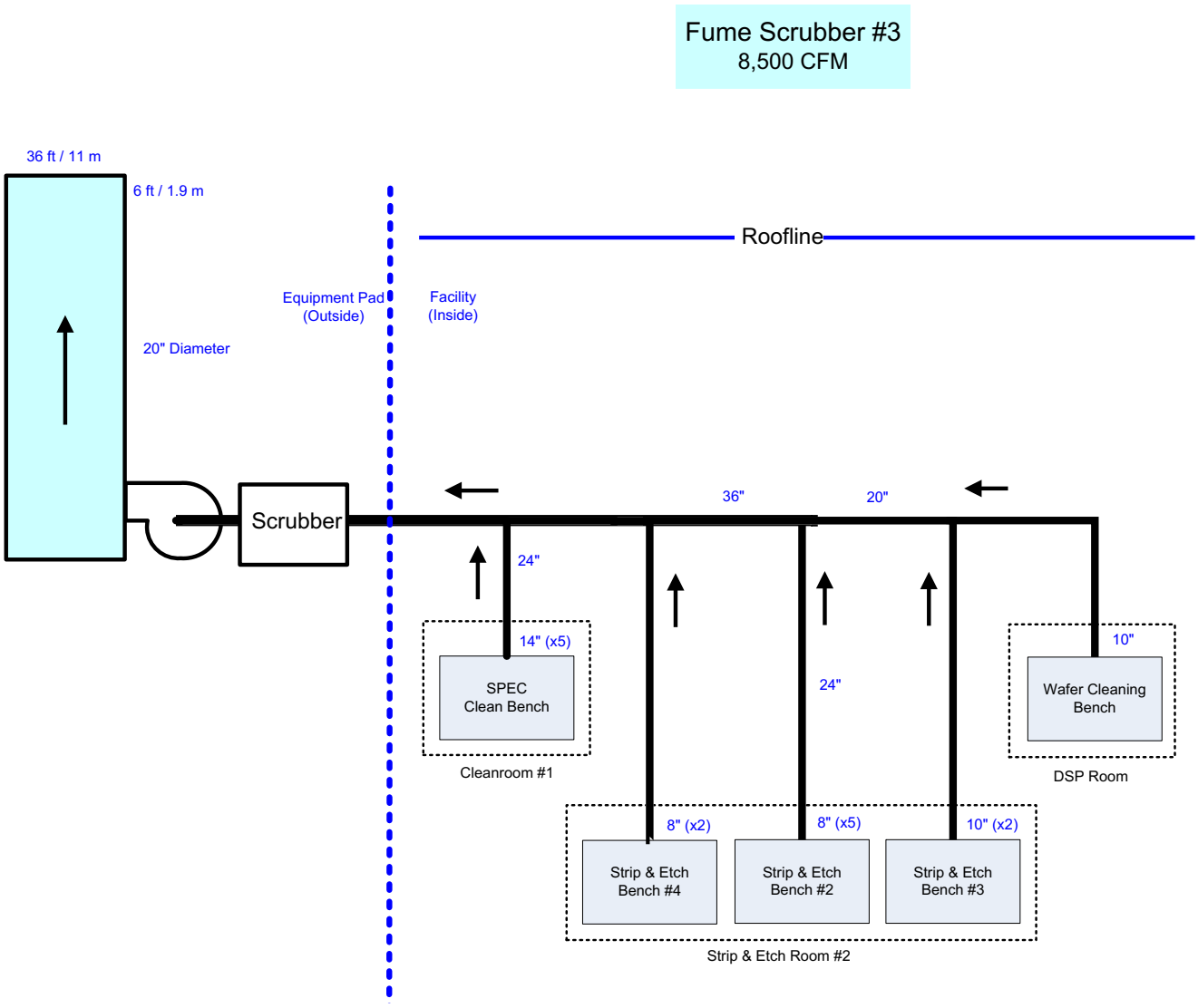


Figure 2.3-1 Generator Stack Diagram

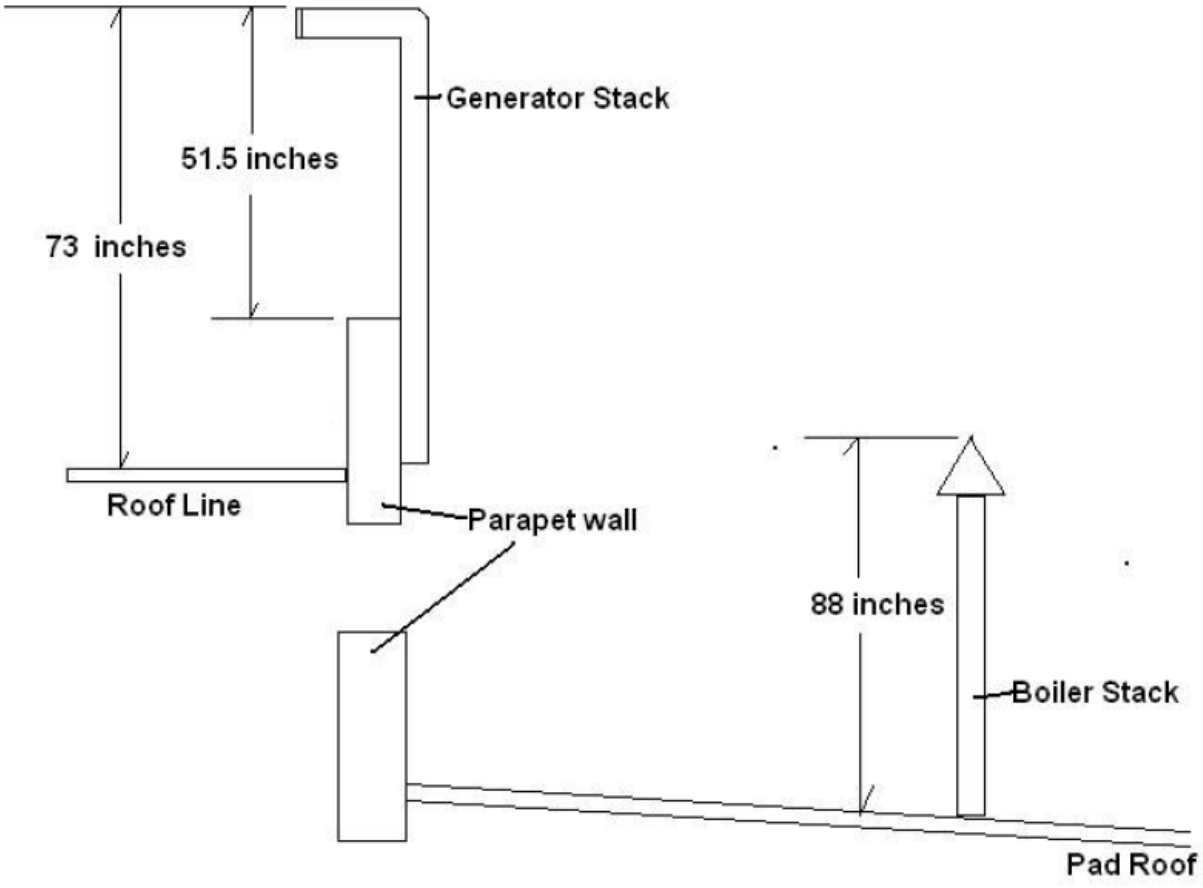


Figure 2.2-1 Boiler Stack Diagram

Tables

Table 2.1-1

Source Parameters								
Emission Source	Source Reference	Source Type	Stack Vertical or Horizontal?	Fixed Rain Cap?	Release Height	Stack Inside Diameter	Gas / Exit Temp.	Gas Flow Rate
Fume Scrubber 01	FUM01	Stack	Vertical	No	11 m	30" / .760m	300 (deg k)	12000(cfm)
Fume Scrubber 02	FUM02	Stack	Vertical	No	11 m	10" /.254m	300 (deg k)	2000(cfm)
Fume Scrubber 03	FUM03	Stack	Vertical	No	11 m	20" / .508m	300 (deg k)	8500(cfm)

Table 2.2-1

EQUIPMENT TYPE & ID NUMBER	MAXIMUM CAPACITY	MAKE	MODEL	SERIAL NUMBER	INSTALLATION/ MFG DATE
Boiler B-1	1919 Mbtu/hr	Raypak	H7-2005A	1310365652	Jan 2014

Table 2.3-1

EQUIPMENT TYPE & ID NUMBER	MAXIMUM CAPACITY	MAKE	MODEL	SERIAL NUMBER	INSTALLATION/ MFG DATE
Emergency Generator EDG-1	250 hp	Detroit Diesel	GA250 / 78.6L / Series 40	WG1308N108 2857	1997

Table 3.0-1

Regulatory	
Chemical	**Regulatory List**
Nitric Acid (HNO3)	AAAQG
Sulfuric Acid (H2SO4)	AAAQG
Ammonia (NH3)	AAAQG
Potassium Hydroxide (KOH)	AAAQG
Hydrofluoric Acid (HF)	AAAQG / Hazardous Air Pollutant
Hydrochloric Acid (HCl)	AAAQG / Hazardous Air Pollutant

Class II Air Quality Permit Renewal Application

Table 3.1-1

Estimated Acid/Base Emission Rates Pure Wafer Inc - Prescott Facility

Species	Location	In Use Wt.%	Molec. Wt.	Partial Press. (psia)	Air Sweep Vel. (mph)	Temp (deg R)	Temp (deg F)	Temp (deg C)	Liq. Area (sqft / unit)	Mass Tran. Coeff. (ft/sec)	Emission Factor (lb/hr/unit)	Units in Use	Uncontrolled Emission (lb/hr)	Uncontrolled Emission (g/s)	Scrubber	Controlled Emission (lb/hr)	Controlled Emission (g/s)	EPA Screen 3 Max Emission Rate (lb/hr)	TPY Uncontrolled	TPY Controlled
NH4OH (29%)*	TEL	2% (1.78)	17	2.43	2.91	609	149	65	1.17	0.010	0.27	2	0.5443	0.06858	1	0.13608	0.01715			
Ammonium	PWC	2% (1.78)	17	2.43	3.17	609	149	65	2.30	0.011	0.57	2	1.1439	0.14412	2	0.28598	0.03603			
Hydroxide	FCD	1%	17	2.43	1.14	609	149	65	2.30	0.005	0.26	1	0.2576	0.03245	2	0.06440	0.00811			
	SPEC	2% (1.78)	17	2.43	3.17	609	149	65	2.30	0.011	0.57	2	1.1494	0.14482	3	0.28735	0.03620			
	DSP	2% (1.78)	17	2.43	1.14	609	149	65	2.30	0.005	0.26	1	0.2576	0.03245	3	0.06440	0.00811			
			wt 17 for NH3								1.93	8	**3.353**	0.42243		0.83821	0.10561	**3.480**	14.69	
HCL (37%)	S&E1 HF/ HCL	25%	36.46	0.189	3.88	528	68	20	1.65	0.008	0.0718	1	0.0718	0.00905	1	0.01795	0.00226			
Hydrochloric	S&E2 HF/ HCL	25%	36.46	0.189	2.51	528	68	20	1.60	0.008	0.0494	1	0.0494	0.00622	3	0.01235	0.00156			
	S&E2 HCL/HNO3	25%	36.46	3.480	2.51	528	68	20	1.60	0.009	0.803	1	0.8030	0.10117	3	0.20075	0.02529			
	S&E3	25%	36.46	0.189	1.86	528	68	20	2.16	0.008	0.053	1	0.0530	0.00668	3	0.01325	0.00167			
	FCD	1.5%	36.46	0.00019	3.17	600	140	60	2.30	0.008	0.00008	1	0.0001	0.00001	3	0.00002	0.00000			
	PWC	1.5%	36.46	0.00019	3.17	600	140	60	2.30	0.008	0.00008	1	0.0001	0.00001	3	0.00002	0.00000			
											0.977	6	**0.977**	0.12314		**0.24434**	0.03078	**0.977**	4.28	1.07
HF (49%)	S&E1 HF	49%	20	7.735	3.88	645	185	85	1.65	0.012	1.6145	1	1.6145	0.20341	1	0.40363	0.05085			
Hydrofluoric	S&E1 HF/HCL	10%	20	0.002	3.88	524	64	18	1.65	0.012	0.0005	1	0.0005	0.00006	1	0.00012	0.00002			
	PWC	< 2%	20	0.002	3.17	531	72	22	2.30	0.010	0.0006	1	0.0006	0.00007	1	0.00015	0.00002			
	FCD	< 2%	20	0.002	3.17	531	72	22	2.30	0.010	0.0006	1	0.0006	0.00007	1	0.00015	0.00002			
	TEL	< 2%	20	0.002	2.91	531	72	22	1.17	0.010	0.0003	1	0.0003	0.00004	1	0.00007	0.00001			
	S&E2 HF	49%	20	7.735	2.52	645	185	85	1.59	0.009	1.1157	1	1.1157	0.14056	3	0.27892	0.03514			
	S&E4 HF	49%	20	7.735	1.14	645	185	85	1.07	0.005	0.4023	1	0.4023	0.05068	3	0.10057	0.01267			
	S&E3 HF	10%	20	3.674	1.86	609	149	65	2.16	0.007	0.6003	1	0.6003	0.07563	3	0.15008	0.01891			
	S&E2 HF/HCL	10%	20	0.002	2.52	531	72	22	1.59	0.009	0.0003	1	0.0003	0.00004	3	0.00008	0.00001			
	S&E3 HF/HCL	10%	20	0.002	1.86	531	72	22	2.16	0.007	0.0004	1	0.0004	0.00005	3	0.00009	0.00001			
	SPEC	< 2%	20	0.002	3.17	531	72	22	2.30	0.010	0.0006	1	0.0006	0.00007	3	0.00015	0.00002			
											3.736	11	**3.736**	0.47070		**0.93400**	0.11768	**3.840**	16.36	4.09
NHO3 (70%)	S&E2	70%	63	0.079	3.17	528	68	20	2.30	0.007	0.052	1	0.0518	0.00653	3	0.01296	0.00163			
Nitric	S&E2 HCL/HNO3	14%	63	0.010	3.17	600	140	60	2.30	0.007	0.006	1	0.0060	0.00076	3	0.00150	0.00019			
	S&E3	70%	63	0.079	3.17	528	68	20	2.30	0.007	0.052	1	0.0518	0.00653	3	0.01296	0.00163			
	S&E4	70%	63	0.079	1.14	528	68	20	1.07	0.003	0.011	1	0.0109	0.00137	3	0.00271	0.00034			
											0.121	4	**0.1205**	0.01518		0.03013	0.00380	**1.226**		
H2SO4	S&E1	96%	98	0.006	3.88	672	212	100	2.30	0.007	0.005	1	0.0048	0.00061	1	0.00121	0.00015			
Sulfuric	S&E2	96%	98	0.006	3.17	672	212	100	2.30	0.006	0.004	1	0.0041	0.00052	3	0.00103	0.00013			
											0.009	2	**0.0090**	0.00113		0.00224	0.00028	**0.008**		
KOH	S&E1	23%	56.11	0	3.17	681	221	105	2.30	0.007	0.000	2	0.0000	0.00000	1	0.00000	0.00000			
Potassium	S&E2	45%	56.11	0	3.17	681	221	105	2.30	0.003	0.000	1	0.0000	0.00000	3	0.00000	0.00000			
											0.000	3	**0.0000**	0.00000		0.00000	0.00000	**0.000**		
																				5.16

* Air-emitted species is ammonia, NH3

Scrubber Efficency **0.75**

Air velocity:

Air flow cross secton = [(14" wide x 2/module) / (12"/ ft.)]*1 ft height = 2.33 sq.ft.

Typical tool enclosure air velocity = 650 cfm/2.33 sq.ft cross section = 279 fpm
Typical Tool Velocity (mph) = 279 fpm x 60min/hr /5280 ft./mile = **3.17**

SE 1 tool enclosure air velocity = 564 cfm/1.65 sq.ft cross section = 341 fpm
SE 1 Velocity (mph) = 341 fpm x 60min/hr /5280 ft./mile = **3.88**

SE 2 tool enclosure air velocity = 354 cfm/1.6 sq.ft cross section = 222 fpm
SE 2 Velocity (mph) = 222 fpm x 60min/hr /5280 ft./mile = **2.52**

SE 3 tool enclosure air velocity = 354 cfm/2.16 sqft cross section = 164 fpm
SE 3 Velocity (mph) = 164 fpm x 60min/hr /5280 ft./mile = **1.86**

Open Front Tool Velocity (mph) = 100 fpm x 60min/hr /5280 ft./mile = **1.14**

Emisson Factor = 3600 sec/hr x Molec Wt.xMTCxArea x (partial Press/(R x ProcessTemp))
R = (Ideal Gas Constant) 10.73 cu.ft.-atm/ lb-mole deg R

Uncontrolled Emiss (lb/hr) = emission factor (lb/hr/unit) x units in use

Controlled Emiss (lb/hr) = Uncontrolled Emissions (lb/hr) x (1 -0.75)
Assumes 75% control efficiency for acids

Uncontrolled Emiss (lb/hr) = emission factor (lb/hr/unit) x units in use

HF Emissions Summary

ton/yr	lb/hr		lb/hr	**Permit**
	Uncontrolled	Scrubber	Controlled	Controlled
9.28	2.120	1	0.530	**0.62**
7.08	1.616	3	0.404	**0.54**
16.36	**3.74**		**0.93**	**1.16**

Table 3.1-2

Uncontrolled Emissions Sum of Processes						
Pollutant	**Emission Point**	**Max. Emission Rate (lb/hr)**	**Screen3 1-Hour (Microgr/m3)**	**Screen3 24-Hour (Microgr/m3)**	**AAAQC Threshold Conc. 1-Hour (Microgr/m3)**	**AAAQC Threshold Conc. 24-Hour (Microgr/m3)**
Hydrofluoric Acid (HF)	HF Processes	3.84000	233.86000	93.54000	563	188
Hydrochloric Acid (HCl)	HCl Processes	0.97736	48.93300	20.37200	210	56
Nitric Acid (HNO3)	HNO3 Processes	1.22600	59.30000	23.72000	113	37.5
Sulfuric Acid (H2SO4)	H2SO4 Processes	0.00800	0.47710	0.51590	225	7.5
Ammonia (NH3)	NH3 Processes	3.48000	315.03000	126.01200	N/A	140
Potassium Hydroxide (KOH)	KOH Processes	0.00000	0.00000	0.00000	60	16

NOTE: Maximum Emission Rates are conservative (higher) in relationship to current emissions calculations of Table 3.1-1

Table 3.2-1

WATER HEATING BOILER EMISSIONS

Boiler (MM Btu/hr)	Pollutant	Emission Factor Natural Gas	#/hr	Conversion Factor	TPY
A		B	= AXB	C	= AXBXC
1.919	$PM_{10/2.5}$	0.0075	0.014	4.38	0.063
1.919	SO_2	0.00059	0.001	4.38	0.005
1.919	NO_x	0.098	0.188	4.38	0.824
1.919	CO	0.082	0.157	4.38	0.689
1.919	VOC	0.0054	0.010	4.38	0.045
1.919	HAP	0.0019	0.004	4.38	0.016

Table 3.3-1

EMERGENCY GENERATOR EMISSIONS

Generator (hp)	Pollutant	Emission Factor Diesel < 600 hp	#/hr	Conversion Factor	TPY
A		B	= AXB	C	= AXBXC
250	$PM_{10/2.5}$	0.0022	0.550	0.25	0.138
250	SO_2	0.0021	0.525	0.25	0.131
250	NO_x	0.031	7.750	0.25	1.938
250	CO	0.0067	1.675	0.25	0.419
250	VOC	0.0025	0.625	0.25	0.156
250	HAP	0.000045	0.011	0.25	0.003

Assumes 500 hours per year of operation.

Attachments

Attachment 3.1-1 – Mass Transfer Model

Attachment 3.1.2a – Honeywell Hydrofluoric Acid Properties

Attachment 3.1.2b – Semiconductor Industries Wafer Fab Exhaust Management

Ammonia

Attachment 3.1-2 – EPA Screen 3 Results, NH_3 Scrub2 Uncontrolled

Attachment 3.1-3 – EPA Screen 3 Results, NH_3 Scrub 3 Uncontrolled

Sulfuric Acid

Attachment 3.1-4 - EPA Screen 3 Results, H_2SO_4 Scrub1 Uncontrolled

Attachment 3.1-5 - EPA Screen 3 Results, H_2SO_4 Scrub 3 Uncontrolled

Hydrochloric Acid

Attachment 3.1-6 – EPA Screen 3 Results, HCl Scrub1 Uncontrolled

Attachment 3.1-7 – EPA Screen 3 Results, HCl Scrub3 Uncontrolled

Hydrofluoric Acid

Attachment 3.1-8 – EPA Screen 3 Results, HF Scrub1 Uncontrolled

Attachment 3.1-9 – EPA Screen 3 Results, HF Scrub 3 Uncontrolled

Nitric Acid

Attachment 3.1-10 – EPA Screen 3 Results, NHO_3 Scrub3 Uncontrolled

Attachment 3.1-1 Mass Transfer Model

2.2.1 Open-Basin Mass Transfer Model for Solute Species

For each aqueous acid to be used at the Exsil facility, a mass transfer model describing open-basin release of solute compounds was used to quantify air emissions. This model is empirical in form, and is based on a mass transfer coefficient that depends largely upon air velocity over the liquid surface and the vapor pressure of the solute species. Applying this model, an hourly emission rate was obtained for all cleaning or etch baths using each acid species. This open-basin model will generally over-estimate releases from the process, since the actual cleaning or etching basins are enclosed during normal operation.

Overall acid/base vapor loss model: $L\ (lb/sec) = M\ K\ A\ (P^{\circ}/R\ T)$

Where:	L	=	vapor loss rate (lb/sec)
	M	=	molecular weight of chemical component (lb/lb-mole)
	A	=	largest exposed liquid surface (ft^2)
	P°	=	vapor pressure at nominal process temperature (psia)
	R	=	universal gas constant = 10.73 psia-ft^3/°R lb-mole
	T	=	nominal process temperature (°R)
	K	=	gas phase mass transfer constant (ft/sec)
		=	$0.00438\ (U)^{.78}\ (18/M)^{0.333}$
	U	=	typical air sweep speed over the tool surface (miles/hr)

The calculations for each acid species, using this model, are summarized in Table 2-2. To conservatively estimate air sweep velocity, the total exhaust flow rate through the facility scrubber (12,000 acfm) was routed through a hypothetical 8.5-foot-high workspace over the aggregate bath surface area (23.54 square feet). Based on this approach, the value of U converts to:

Air sweep path area = $[23.54\ ft^2]^{0.5}$ x 8.5 ft. = 41.2 ft^2

Velocity = 12,000 ft^3/min / 41.2 ft^2 = 291.3 ft/min

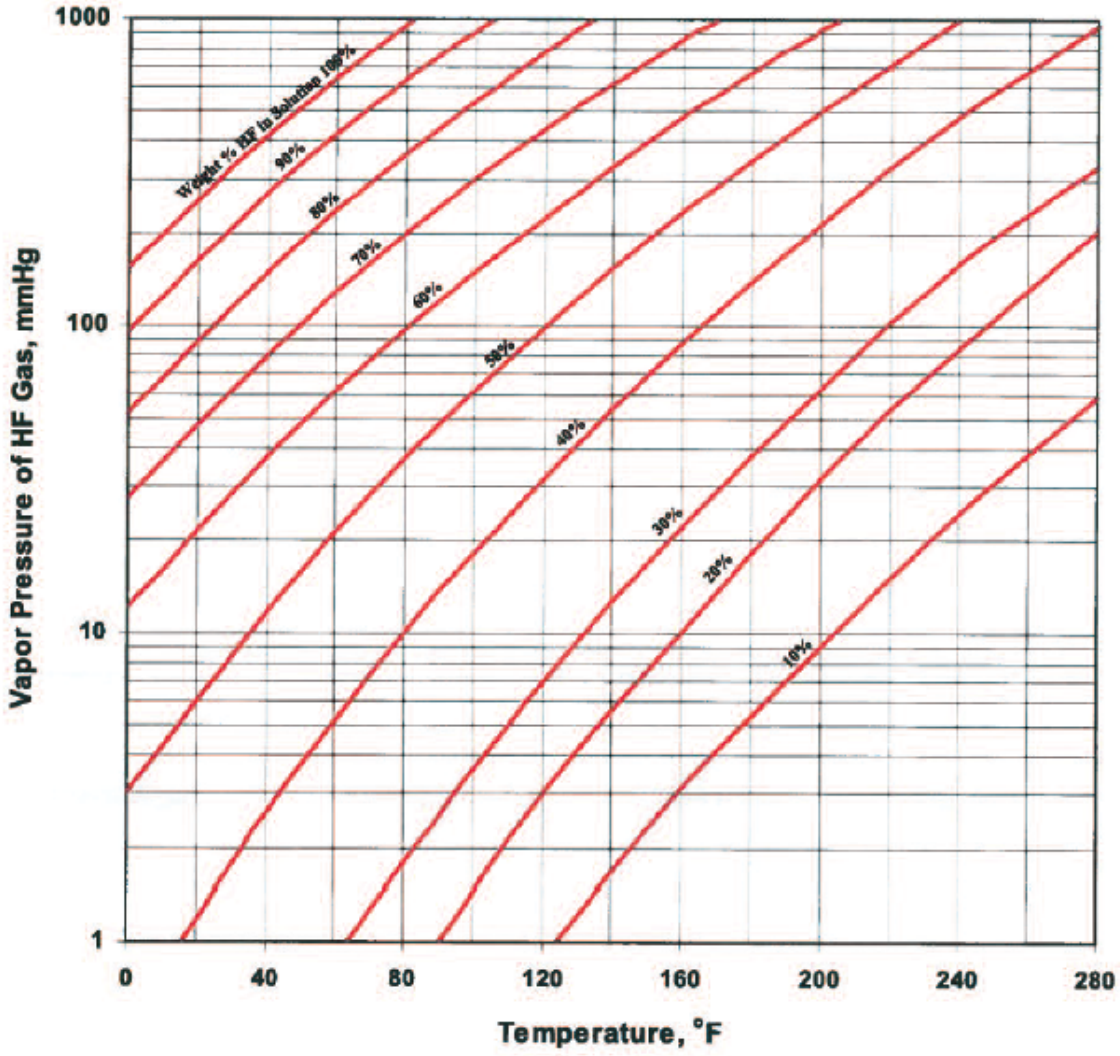
U = 291 ft/min x (60 min/hr) / (5,280 ft / mile) = 3.31 miles/hr

For all chemicals, the mass transfer coefficient (K) is calculated from:

$K = .00438 \times (3.31)^{.78} \times (18/M)^{0.333}$

Attachment 3.1.2a – Honeywell Hydrofluoric Acid Properties

Partial Vapor Pressure of HF over Aqueous Solutions of HF



Attachment 3.1.2b – Semiconductor Industries Wafer Fab Exhaust Management

1.3.1.2 Solution Baths of Hot Nitric Acid

Heated solution baths of nitric acid can be used in wet benches, in addition to chemical wafer thinning baths. The temperature and concentration of the nitric acid in solution are crucial to emissions from these baths.

The temperature of the solution bath of nitric acid (assuming everything else is constant) is critical to nitric acid emissions, as reflected below in vapor pressure (see Reference 1).

- Vapor pressure of 70% nitric acid solution at 25°C: 4.10 mmHg
- Vapor pressure of 70% nitric acid solution at 50°C: 16.5 mmHg
- Vapor pressure of 70% nitric acid solution at 70°C: 43.3 mmHg

The temperature increase of twofold, from 25 to 50°C, causes a nitric acid emission increase of about four times. The temperature increase of almost three times, from 25 to 70°C, causes nitric acid emissions to increase over 10 times.

The concentration of the solution bath of nitric acid (assuming everything else is constant) is critical to nitric acid emissions, as reflected below in vapor pressure.[1]

- Vapor pressure of 25% nitric acid solution at 70°C: 0.54 mmHg
- Vapor pressure of 50% nitric acid solution at 70°C: 7.25 mmHg
- Vapor pressure of 70% nitric acid solution at 70°C: 43.3 mmHg

The concentration increase of twofold, from 25 to 50%, causes nitric acid emissions to increase over 13 times. The concentration increase of almost three times, from 25 to 70%, causes nitric acid emissions to increase about 80 times!

When reviewing each bath and its chemistries, it is important to note temperature and concentration to determine emissions and their impact. Other factors in determining bath emissions are surface area, air velocity over the surface, and if the bath is being mixed, air bubbled, etc. If nitric acid emissions are high enough from the

Attachment 3.1-2: NH_3 Scrub2

```
******  SCREEN3 MODEL  ******
 **** VERSION DATED 96043 ****

ENTER TITLE FOR THIS RUN (UP TO 79 CHARACTERS):
NH3 Scrub2

ENTER SOURCE TYPE: P    FOR POINT
                   F    FOR FLARE
                   A    FOR AREA
                   V    FOR VOLUME
  ALSO ENTER ANY OF THE FOLLOWING OPTIONS ON THE SAME LINE:

    N    - TO USE THE NON-REGULATORY BUT CONSERVATIVE BRODE 2
           MIXING HEIGHT OPTION,
    nn.n - TO USE AN ANEMOMETER HEIGHT OTHER THAN THE REGULATORY
           (DEFAULT) 10 METER HEIGHT.
    SS   - TO USE A NON-REGULATORY CAVITY CALCULATION ALTERNATIVE
  Example - PN 7.0 SS (entry for a point source)

 ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:
p
ENTER EMISSION RATE (G/S):
.2167
ENTER STACK HEIGHT (M):
11
ENTER STACK INSIDE DIAMETER (M):
.254
ENTER STACK GAS EXIT VELOCITY OR FLOW RATE:
OPTION 1 : EXIT VELOCITY (M/S):
 DEFAULT - ENTER NUMBER ONLY
OPTION 2 : VOLUME FLOW RATE (M**3/S):
           EXAMPLE "VM=20.00"
OPTION 3 : VOLUME FLOW RATE (ACFM):
           EXAMPLE "VF=1000.00"
vf=2000
ENTER STACK GAS EXIT TEMPERATURE (K):
300
ENTER AMBIENT AIR TEMPERATURE (USE 293 FOR DEFAULT) (K):
293
ENTER RECEPTOR HEIGHT ABOVE GROUND (FOR FLAGPOLE RECEPTOR) (M):
0
ENTER URBAN/RURAL OPTION (U=URBAN, R=RURAL):
r
CONSIDER BUILDING DOWNWASH IN CALCS?  ENTER Y OR N:
y
ENTER BUILDING HEIGHT (M):
9.1
ENTER MINIMUM HORIZ BLDG DIMENSION (M):
50
ENTER MAXIMUM HORIZ BLDG DIMENSION (M):
62
USE COMPLEX TERRAIN SCREEN FOR TERRAIN ABOVE STACK HEIGHT?
ENTER Y OR N:
n
USE SIMPLE TERRAIN SCREEN WITH TERRAIN ABOVE STACK BASE?
ENTER Y OR N:
n
ENTER CHOICE OF METEOROLOGY;
1 - FULL METEOROLOGY (ALL STABILITIES & WIND SPEEDS)
2 - INPUT SINGLE STABILITY CLASS
3 - INPUT SINGLE STABILITY CLASS AND WIND SPEED
1
USE AUTOMATED DISTANCE ARRAY? ENTER Y OR N:
y
ENTER MIN AND MAX DISTANCES TO USE (M):
10, 2000

***********************************
*** SCREEN AUTOMATED DISTANCES ***
***********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC          U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)  STAB  (M/S)  (M/S)   (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    10.   .0000       0    .0    .0    .0    .00    .00    .00    NA
   100.   217.4       6    3.0   3.2 10000.0   11.31   4.07   7.21   SS
   200.   130.2       6    2.5   2.6 10000.0   12.32   7.73   8.04   SS
   300.   109.1       6    2.0   2.1 10000.0   12.96   11.23   8.62   SS
   400.   95.88       6    2.0   2.1 10000.0   12.96   14.64   9.90   SS
   500.   85.24       6    1.5   1.6 10000.0   14.59   17.97   10.16   SS
   600.   77.33       6    1.5   1.6 10000.0   14.59   21.24   10.96   SS
   700.   71.04       6    1.5   1.6 10000.0   14.59   24.46   12.01   SS
   800.   64.73       6    1.5   1.6 10000.0   14.59   27.63   13.01   SS
   900.   58.73       6    1.5   1.6 10000.0   14.59   30.78   13.75   SS
  1000.   53.54       6    1.5   1.6 10000.0   14.59   33.88   14.64   SS
  1100.   48.92       6    1.5   1.6 10000.0   14.59   36.96   15.48   SS
  1200.   44.82       6    1.5   1.6 10000.0   14.59   40.01   16.30   SS
  1300.   41.63       6    1.0   1.1 10000.0   20.79   43.04   16.47   SS
  1400.   39.87       6    1.0   1.1 10000.0   20.79   46.05   17.26   SS
  1500.   38.09       6    1.0   1.1 10000.0   20.79   49.03   18.03   SS
  1600.   36.32       6    1.0   1.1 10000.0   20.79   51.99   18.78   SS
  1700.   34.61       6    1.0   1.1 10000.0   20.79   54.94   19.52   SS
  1800.   32.98       6    1.0   1.1 10000.0   20.79   57.87   20.23   SS
  1900.   31.42       6    1.0   1.1 10000.0   20.79   60.78   20.94   SS
  2000.   29.94       6    1.0   1.1 10000.0   20.79   63.68   21.63   SS
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
   92.   229.9       6    3.0   3.2 10000.0   11.30   3.80   7.11   SS
```

Attachment 3.1-3: NH_3 Scrub 3

```
******  SCREEN3 MODEL  ******
 **** VERSION DATED 96043 ****

ENTER TITLE FOR THIS RUN (UP TO 79 CHARACTERS):
NH3 Scrub3

ENTER SOURCE TYPE: P    FOR POINT
                   F    FOR FLARE
                   A    FOR AREA
                   V    FOR VOLUME
  ALSO ENTER ANY OF THE FOLLOWING OPTIONS ON THE SAME LINE:

    N    - TO USE THE NON-REGULATORY BUT CONSERVATIVE BRODE 2
           MIXING HEIGHT OPTION,
    nn.n - TO USE AN ANEMOMETER HEIGHT OTHER THAN THE REGULATORY
           (DEFAULT) 10 METER HEIGHT.
    SS   - TO USE A NON-REGULATORY CAVITY CALCULATION ALTERNATIVE
  Example - PN 7.0 SS (entry for a point source)

 ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:
p
ENTER EMISSION RATE (G/S):
.2218
ENTER STACK HEIGHT (M):
11
ENTER STACK INSIDE DIAMETER (M):
.508
ENTER STACK GAS EXIT VELOCITY OR FLOW RATE:
OPTION 1 : EXIT VELOCITY (M/S):
 DEFAULT - ENTER NUMBER ONLY
OPTION 2 : VOLUME FLOW RATE (M**3/S):
           EXAMPLE "VM=20.00"
OPTION 3 : VOLUME FLOW RATE (ACFM):
           EXAMPLE "VF=1000.00"
vf=8500
ENTER STACK GAS EXIT TEMPERATURE (K):
300
ENTER AMBIENT AIR TEMPERATURE (USE 293 FOR DEFAULT) (K):
293
ENTER RECEPTOR HEIGHT ABOVE GROUND (FOR FLAGPOLE RECEPTOR) (M):
0
ENTER URBAN/RURAL OPTION (U=URBAN, R=RURAL):
r
CONSIDER BUILDING DOWNWASH IN CALCS?  ENTER Y OR N:
y
ENTER BUILDING HEIGHT (M):
9.1
ENTER MINIMUM HORIZ BLDG DIMENSION (M):
50
ENTER MAXIMUM HORIZ BLDG DIMENSION (M):
62
USE COMPLEX TERRAIN SCREEN FOR TERRAIN ABOVE STACK HEIGHT?
ENTER Y OR N:
n
USE SIMPLE TERRAIN SCREEN WITH TERRAIN ABOVE STACK BASE?
ENTER Y OR N:
n
ENTER CHOICE OF METEOROLOGY;
1 - FULL METEOROLOGY (ALL STABILITIES & WIND SPEEDS)
2 - INPUT SINGLE STABILITY CLASS
3 - INPUT SINGLE STABILITY CLASS AND WIND SPEED
1
USE AUTOMATED DISTANCE ARRAY? ENTER Y OR N:
y
ENTER MIN AND MAX DISTANCES TO USE (M):
10, 2000

***********************************
*** SCREEN AUTOMATED DISTANCES ***
***********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC          U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)  STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    10.  .9991E-04    6     1.0    1.1 10000.0   27.08    4.62    4.61    NO
   100.   83.82       6     4.0    4.2 10000.0   12.48    4.07    6.11    SS
   200.   58.44       6     4.0    4.2 10000.0   13.42    7.73    7.51    SS
   300.   45.31       6     4.0    4.2 10000.0   14.33   11.23    8.84    SS
   400.   41.46       6     4.0    4.2 10000.0   14.33   14.64   10.11    SS
   500.   37.82       6     3.5    3.7 10000.0   15.04   17.97   10.93    SS
   600.   33.58       6     3.0    3.2 10000.0   16.05   21.24   11.18    SS
   700.   31.55       6     3.0    3.2 10000.0   16.05   24.46   12.21    SS
   800.   29.50       6     2.5    2.6 10000.0   17.51   27.63   12.70    SS
   900.   28.04       6     2.5    2.6 10000.0   17.51   30.78   13.68    SS
  1000.   26.19       6     2.5    2.6 10000.0   17.51   33.88   14.38    SS
  1100.   25.27       6     1.0    1.1 10000.0   27.08   37.25   15.52    NO
  1200.   25.71       6     1.0    1.1 10000.0   27.08   40.28   16.32    NO
  1300.   25.82       6     1.0    1.1 10000.0   27.08   43.29   17.10    NO
  1400.   25.68       6     1.0    1.1 10000.0   27.08   46.28   17.86    NO
  1500.   25.35       6     1.0    1.1 10000.0   27.08   49.25   18.61    NO
  1600.   24.89       6     1.0    1.1 10000.0   27.08   52.20   19.34    NO
  1700.   24.34       6     1.0    1.1 10000.0   27.08   55.13   20.05    NO
  1800.   23.73       6     1.0    1.1 10000.0   27.08   58.05   20.75    NO
  1900.   23.08       6     1.0    1.1 10000.0   27.08   60.95   21.44    NO
  2000.   22.42       6     1.0    1.1 10000.0   27.08   63.84   22.11    NO
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
   92.   85.13       6     4.0    4.2 10000.0   12.48    3.80    6.01    SS
```

Attachment 3.1-4: H_2SO_4 Scrub1 Uncontrolled

```
******  SCREEN3 MODEL  ******
 **** VERSION DATED 96043 ****

ENTER TITLE FOR THIS RUN (UP TO 79 CHARACTERS):
H2SO4 Scrub1 Uncontrolled

ENTER SOURCE TYPE: P    FOR POINT
                   F    FOR FLARE
                   A    FOR AREA
                   V    FOR VOLUME
  ALSO ENTER ANY OF THE FOLLOWING OPTIONS ON THE SAME LINE:

    N    - TO USE THE NON-REGULATORY BUT CONSERVATIVE BRODE 2
           MIXING HEIGHT OPTION,
    nn.n - TO USE AN ANEMOMETER HEIGHT OTHER THAN THE REGULATORY
           (DEFAULT) 10 METER HEIGHT.
    SS   - TO USE A NON-REGULATORY CAVITY CALCULATION ALTERNATIVE
  Example - PN 7.0 SS (entry for a point source)

 ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:
p
ENTER EMISSION RATE (G/S):
.0005
ENTER STACK HEIGHT (M):
11
ENTER STACK INSIDE DIAMETER (M):
.760
ENTER STACK GAS EXIT VELOCITY OR FLOW RATE:
OPTION 1 : EXIT VELOCITY (M/S):
 DEFAULT - ENTER NUMBER ONLY
OPTION 2 : VOLUME FLOW RATE (M**3/S):
           EXAMPLE "VM=20.00"
OPTION 3 : VOLUME FLOW RATE (ACFM):
           EXAMPLE "VF=1000.00"
vf=12000
ENTER STACK GAS EXIT TEMPERATURE (K):
300
ENTER AMBIENT AIR TEMPERATURE (USE 293 FOR DEFAULT) (K):
293
ENTER RECEPTOR HEIGHT ABOVE GROUND (FOR FLAGPOLE RECEPTOR) (M):
0
ENTER URBAN/RURAL OPTION (U=URBAN, R=RURAL):
r
CONSIDER BUILDING DOWNWASH IN CALCS?  ENTER Y OR N:
y
ENTER BUILDING HEIGHT (M):
9.1
ENTER MINIMUM HORIZ BLDG DIMENSION (M):
50
ENTER MAXIMUM HORIZ BLDG DIMENSION (M):
62
USE COMPLEX TERRAIN SCREEN FOR TERRAIN ABOVE STACK HEIGHT?
ENTER Y OR N:
n
USE SIMPLE TERRAIN SCREEN WITH TERRAIN ABOVE STACK BASE?
ENTER Y OR N:
n
ENTER CHOICE OF METEOROLOGY;
1 - FULL METEOROLOGY (ALL STABILITIES & WIND SPEEDS)
2 - INPUT SINGLE STABILITY CLASS
3 - INPUT SINGLE STABILITY CLASS AND WIND SPEED
1
USE AUTOMATED DISTANCE ARRAY? ENTER Y OR N:
y
ENTER MIN AND MAX DISTANCES TO USE (M):
10, 2000

***********************************
*** SCREEN AUTOMATED DISTANCES ***
***********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC          U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)  STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    10.   .8861E-09    6     1.0    1.1 10000.0   29.04    4.30    4.29    NO
   100.   .2743        6     4.0    4.2 10000.0   12.08    4.07    6.72    SS
   200.   .1414        6     4.0    4.2 10000.0   13.78    7.73    8.09    SS
   300.   .1031        6     4.0    4.2 10000.0   14.81   11.23    9.39    SS
   400.   .9199E-01    6     4.0    4.2 10000.0   14.81   14.64   10.64    SS
   500.   .8079E-01    6     3.5    3.7 10000.0   15.54   17.97   11.05    SS
   600.   .7424E-01    6     3.0    3.2 10000.0   16.56   21.24   11.67    SS
   700.   .6923E-01    6     3.0    3.2 10000.0   16.56   24.46   12.69    SS
   800.   .6507E-01    6     2.5    2.6 10000.0   18.02   27.63   13.16    SS
   900.   .6091E-01    6     2.5    2.6 10000.0   18.02   30.78   13.88    SS
  1000.   .5733E-01    6     2.5    2.6 10000.0   18.02   33.88   14.76    SS
  1100.   .5504E-01    6     2.0    2.1 10000.0   20.24   36.96   15.07    SS
  1200.   .5282E-01    6     2.0    2.1 10000.0   20.24   40.01   15.90    SS
  1300.   .5043E-01    6     2.0    2.1 10000.0   20.24   43.04   16.71    SS
  1400.   .4933E-01    6     1.0    1.1 10000.0   29.04   46.33   18.01    NO
  1500.   .4924E-01    6     1.0    1.1 10000.0   29.04   49.30   18.75    NO
  1600.   .4882E-01    6     1.0    1.1 10000.0   29.04   52.25   19.48    NO
  1700.   .4816E-01    6     1.0    1.1 10000.0   29.04   55.18   20.18    NO
  1800.   .4732E-01    6     1.0    1.1 10000.0   29.04   58.10   20.88    NO
  1900.   .4636E-01    6     1.0    1.1 10000.0   29.04   61.00   21.56    NO
  2000.   .4531E-01    6     1.0    1.1 10000.0   29.04   63.88   22.23    NO
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
   92.   .2852        6     4.0    4.2 10000.0   12.08    3.80    6.62    SS
```

Attachment 3.1-5: H_2SO_4 Scrub3

```
******  SCREEN3 MODEL  ******
 **** VERSION DATED 96043 ****

ENTER TITLE FOR THIS RUN (UP TO 79 CHARACTERS):
H2SO4 Scrub3

ENTER SOURCE TYPE: P    FOR POINT
                   F    FOR FLARE
                   A    FOR AREA
                   V    FOR VOLUME
  ALSO ENTER ANY OF THE FOLLOWING OPTIONS ON THE SAME LINE:

    N    - TO USE THE NON-REGULATORY BUT CONSERVATIVE BRODE 2
           MIXING HEIGHT OPTION,
    nn.n - TO USE AN ANEMOMETER HEIGHT OTHER THAN THE REGULATORY
           (DEFAULT) 10 METER HEIGHT.
    SS   - TO USE A NON-REGULATORY CAVITY CALCULATION ALTERNATIVE
  Example - PN 7.0 SS (entry for a point source)

 ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:
p
ENTER EMISSION RATE (G/S):
.0005
ENTER STACK HEIGHT (M):
11
ENTER STACK INSIDE DIAMETER (M):
.508
ENTER STACK GAS EXIT VELOCITY OR FLOW RATE:
OPTION 1 : EXIT VELOCITY (M/S):
 DEFAULT - ENTER NUMBER ONLY
OPTION 2 : VOLUME FLOW RATE (M**3/S):
           EXAMPLE "VM=20.00"
OPTION 3 : VOLUME FLOW RATE (ACFM):
           EXAMPLE "VF=1000.00"
vf=8500
ENTER STACK GAS EXIT TEMPERATURE (K):
300
ENTER AMBIENT AIR TEMPERATURE (USE 293 FOR DEFAULT) (K):
293
ENTER RECEPTOR HEIGHT ABOVE GROUND (FOR FLAGPOLE RECEPTOR) (M):
0
ENTER URBAN/RURAL OPTION (U=URBAN, R=RURAL):
r
CONSIDER BUILDING DOWNWASH IN CALCS?  ENTER Y OR N:
y
ENTER BUILDING HEIGHT (M):
9.1
ENTER MINIMUM HORIZ BLDG DIMENSION (M):
50
ENTER MAXIMUM HORIZ BLDG DIMENSION (M):
62
USE COMPLEX TERRAIN SCREEN FOR TERRAIN ABOVE STACK HEIGHT?
ENTER Y OR N:
n
USE SIMPLE TERRAIN SCREEN WITH TERRAIN ABOVE STACK BASE?
ENTER Y OR N:
n
ENTER CHOICE OF METEOROLOGY;
1 - FULL METEOROLOGY (ALL STABILITIES & WIND SPEEDS)
2 - INPUT SINGLE STABILITY CLASS
3 - INPUT SINGLE STABILITY CLASS AND WIND SPEED
1
USE AUTOMATED DISTANCE ARRAY? ENTER Y OR N:
y
ENTER MIN AND MAX DISTANCES TO USE (M):
10, 2000

***********************************
*** SCREEN AUTOMATED DISTANCES ***
***********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC           U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)  STAB  (M/S)  (M/S)    (M)   HT (M)  Y (M)  Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    10.  .2252E-06    6     1.0    1.1 10000.0   27.08    4.62    4.61    NO
   100.  .1890        6     4.0    4.2 10000.0   12.48    4.07    6.11    SS
   200.  .1318        6     4.0    4.2 10000.0   13.42    7.73    7.51    SS
   300.  .1021        6     4.0    4.2 10000.0   14.33   11.23    8.84    SS
   400.  .9346E-01    6     4.0    4.2 10000.0   14.33   14.64   10.11    SS
   500.  .8525E-01    6     3.5    3.7 10000.0   15.04   17.97   10.93    SS
   600.  .7570E-01    6     3.0    3.2 10000.0   16.05   21.24   11.18    SS
   700.  .7111E-01    6     3.0    3.2 10000.0   16.05   24.46   12.21    SS
   800.  .6650E-01    6     2.5    2.6 10000.0   17.51   27.63   12.70    SS
   900.  .6322E-01    6     2.5    2.6 10000.0   17.51   30.78   13.68    SS
  1000.  .5905E-01    6     2.5    2.6 10000.0   17.51   33.88   14.38    SS
  1100.  .5696E-01    6     1.0    1.1 10000.0   27.08   37.25   15.52    NO
  1200.  .5797E-01    6     1.0    1.1 10000.0   27.08   40.28   16.32    NO
  1300.  .5821E-01    6     1.0    1.1 10000.0   27.08   43.29   17.10    NO
  1400.  .5788E-01    6     1.0    1.1 10000.0   27.08   46.28   17.86    NO
  1500.  .5714E-01    6     1.0    1.1 10000.0   27.08   49.25   18.61    NO
  1600.  .5611E-01    6     1.0    1.1 10000.0   27.08   52.20   19.34    NO
  1700.  .5487E-01    6     1.0    1.1 10000.0   27.08   55.13   20.05    NO
  1800.  .5349E-01    6     1.0    1.1 10000.0   27.08   58.05   20.75    NO
  1900.  .5203E-01    6     1.0    1.1 10000.0   27.08   60.95   21.44    NO
  2000.  .5053E-01    6     1.0    1.1 10000.0   27.08   63.84   22.11    NO
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
   92.  .1919        6     4.0    4.2 10000.0   12.48    3.80    6.01    SS
```

Attachment 3.1-6: HCl Scrub1

```
******  SCREEN3 MODEL  ******
 **** VERSION DATED 96043 ****

ENTER TITLE FOR THIS RUN (UP TO 79 CHARACTERS):
HCL Scrub 1 Uncontrolled

ENTER SOURCE TYPE: P    FOR POINT
                   F    FOR FLARE
                   A    FOR AREA
                   V    FOR VOLUME
  ALSO ENTER ANY OF THE FOLLOWING OPTIONS ON THE SAME LINE:

    N    - TO USE THE NON-REGULATORY BUT CONSERVATIVE BRODE 2
           MIXING HEIGHT OPTION,
    nn.n - TO USE AN ANEMOMETER HEIGHT OTHER THAN THE REGULATORY
           (DEFAULT) 10 METER HEIGHT.
    SS   - TO USE A NON-REGULATORY CAVITY CALCULATION ALTERNATIVE
  Example - PN 7.0 SS (entry for a point source)

 ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:
p
ENTER EMISSION RATE (G/S):
.009
ENTER STACK HEIGHT (M):
11
ENTER STACK INSIDE DIAMETER (M):
.760
ENTER STACK GAS EXIT VELOCITY OR FLOW RATE:
OPTION 1 : EXIT VELOCITY (M/S):
 DEFAULT - ENTER NUMBER ONLY
OPTION 2 : VOLUME FLOW RATE (M**3/S):
           EXAMPLE "VM=20.00"
OPTION 3 : VOLUME FLOW RATE (ACFM):
           EXAMPLE "VF=1000.00"
vf=12000
ENTER STACK GAS EXIT TEMPERATURE (K):
300
ENTER AMBIENT AIR TEMPERATURE (USE 293 FOR DEFAULT) (K):
293
ENTER RECEPTOR HEIGHT ABOVE GROUND (FOR FLAGPOLE RECEPTOR) (M):
0
ENTER URBAN/RURAL OPTION (U=URBAN, R=RURAL):
r
CONSIDER BUILDING DOWNWASH IN CALCS?  ENTER Y OR N:
y
ENTER BUILDING HEIGHT (M):
9.1
ENTER MINIMUM HORIZ BLDG DIMENSION (M):
50
ENTER MAXIMUM HORIZ BLDG DIMENSION (M):
62
USE COMPLEX TERRAIN SCREEN FOR TERRAIN ABOVE STACK HEIGHT?
ENTER Y OR N:
n
USE SIMPLE TERRAIN SCREEN WITH TERRAIN ABOVE STACK BASE?
ENTER Y OR N:
n
ENTER CHOICE OF METEOROLOGY;
1 - FULL METEOROLOGY (ALL STABILITIES & WIND SPEEDS)
2 - INPUT SINGLE STABILITY CLASS
3 - INPUT SINGLE STABILITY CLASS AND WIND SPEED
1
USE AUTOMATED DISTANCE ARRAY? ENTER Y OR N:
y
ENTER MIN AND MAX DISTANCES TO USE (M):
10,2000

***********************************
*** SCREEN AUTOMATED DISTANCES ***
***********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC           U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)  STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    10.   .1595E-07    6     1.0    1.1 10000.0   29.04    4.30    4.29    NO
   100.   4.938        6     4.0    4.2 10000.0   12.08    4.07    6.72    SS
   200.   2.545        6     4.0    4.2 10000.0   13.78    7.73    8.09    SS
   300.   1.856        6     4.0    4.2 10000.0   14.81   11.23    9.39    SS
   400.   1.656        6     4.0    4.2 10000.0   14.81   14.64   10.64    SS
   500.   1.454        6     3.5    3.7 10000.0   15.54   17.97   11.05    SS
   600.   1.336        6     3.0    3.2 10000.0   16.56   21.24   11.67    SS
   700.   1.246        6     3.0    3.2 10000.0   16.56   24.46   12.69    SS
   800.   1.171        6     2.5    2.6 10000.0   18.02   27.63   13.16    SS
   900.   1.096        6     2.5    2.6 10000.0   18.02   30.78   13.88    SS
  1000.   1.032        6     2.5    2.6 10000.0   18.02   33.88   14.76    SS
  1100.   .9908        6     2.0    2.1 10000.0   20.24   36.96   15.07    SS
  1200.   .9507        6     2.0    2.1 10000.0   20.24   40.01   15.90    SS
  1300.   .9078        6     2.0    2.1 10000.0   20.24   43.04   16.71    SS
  1400.   .8880        6     1.0    1.1 10000.0   29.04   46.33   18.01    NO
  1500.   .8863        6     1.0    1.1 10000.0   29.04   49.30   18.75    NO
  1600.   .8788        6     1.0    1.1 10000.0   29.04   52.25   19.48    NO
  1700.   .8669        6     1.0    1.1 10000.0   29.04   55.18   20.18    NO
  1800.   .8518        6     1.0    1.1 10000.0   29.04   58.10   20.88    NO
  1900.   .8344        6     1.0    1.1 10000.0   29.04   61.00   21.56    NO
  2000.   .8155        6     1.0    1.1 10000.0   29.04   63.88   22.23    NO
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
   92.   5.133        6     4.0    4.2 10000.0   12.08    3.80    6.62    SS
```

Attachment 3.1-7: HCl Scrub3

```
******  SCREEN3 MODEL  ******
 **** VERSION DATED 96043 ****

ENTER TITLE FOR THIS RUN (UP TO 79 CHARACTERS):
HCL Scrub 3 uncontrolled

ENTER SOURCE TYPE: P    FOR POINT
                   F    FOR FLARE
                   A    FOR AREA
                   V    FOR VOLUME
  ALSO ENTER ANY OF THE FOLLOWING OPTIONS ON THE SAME LINE:

    N    - TO USE THE NON-REGULATORY BUT CONSERVATIVE BRODE 2
           MIXING HEIGHT OPTION,
    nn.n - TO USE AN ANEMOMETER HEIGHT OTHER THAN THE REGULATORY
           (DEFAULT) 10 METER HEIGHT.
    SS   - TO USE A NON-REGULATORY CAVITY CALCULATION ALTERNATIVE
  Example - PN 7.0 SS (entry for a point source)

 ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:
p
ENTER EMISSION RATE (G/S):
.1141
ENTER STACK HEIGHT (M):
11
ENTER STACK INSIDE DIAMETER (M):
.508
ENTER STACK GAS EXIT VELOCITY OR FLOW RATE:
OPTION 1 : EXIT VELOCITY (M/S):
 DEFAULT - ENTER NUMBER ONLY
OPTION 2 : VOLUME FLOW RATE (M**3/S):
           EXAMPLE "VM=20.00"
OPTION 3 : VOLUME FLOW RATE (ACFM):
           EXAMPLE "VF=1000.00"
vf=8500
ENTER STACK GAS EXIT TEMPERATURE (K):
300
ENTER AMBIENT AIR TEMPERATURE (USE 293 FOR DEFAULT) (K):
293
ENTER RECEPTOR HEIGHT ABOVE GROUND (FOR FLAGPOLE RECEPTOR) (M):
0
ENTER URBAN/RURAL OPTION (U=URBAN, R=RURAL):
r
CONSIDER BUILDING DOWNWASH IN CALCS?  ENTER Y OR N:
y
ENTER BUILDING HEIGHT (M):
9.1
ENTER MINIMUM HORIZ BLDG DIMENSION (M):
50
ENTER MAXIMUM HORIZ BLDG DIMENSION (M):
62
USE COMPLEX TERRAIN SCREEN FOR TERRAIN ABOVE STACK HEIGHT?
ENTER Y OR N:
n
USE SIMPLE TERRAIN SCREEN WITH TERRAIN ABOVE STACK BASE?
ENTER Y OR N:
n
ENTER CHOICE OF METEOROLOGY;
1 - FULL METEOROLOGY (ALL STABILITIES & WIND SPEEDS)
2 - INPUT SINGLE STABILITY CLASS
3 - INPUT SINGLE STABILITY CLASS AND WIND SPEED
1
USE AUTOMATED DISTANCE ARRAY? ENTER Y OR N:
y
ENTER MIN AND MAX DISTANCES TO USE (M):
10,2000

***********************************
*** SCREEN AUTOMATED DISTANCES ***
***********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC          U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)  STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    10.  .5140E-04    6     1.0    1.1 10000.0   27.08    4.62    4.61    NO
   100.   43.12       6     4.0    4.2 10000.0   12.48    4.07    6.11    SS
   200.   30.07       6     4.0    4.2 10000.0   13.42    7.73    7.51    SS
   300.   23.31       6     4.0    4.2 10000.0   14.33   11.23    8.84    SS
   400.   21.33       6     4.0    4.2 10000.0   14.33   14.64   10.11    SS
   500.   19.45       6     3.5    3.7 10000.0   15.04   17.97   10.93    SS
   600.   17.27       6     3.0    3.2 10000.0   16.05   21.24   11.18    SS
   700.   16.23       6     3.0    3.2 10000.0   16.05   24.46   12.21    SS
   800.   15.18       6     2.5    2.6 10000.0   17.51   27.63   12.70    SS
   900.   14.43       6     2.5    2.6 10000.0   17.51   30.78   13.68    SS
  1000.   13.48       6     2.5    2.6 10000.0   17.51   33.88   14.38    SS
  1100.   13.00       6     1.0    1.1 10000.0   27.08   37.25   15.52    NO
  1200.   13.23       6     1.0    1.1 10000.0   27.08   40.28   16.32    NO
  1300.   13.28       6     1.0    1.1 10000.0   27.08   43.29   17.10    NO
  1400.   13.21       6     1.0    1.1 10000.0   27.08   46.28   17.86    NO
  1500.   13.04       6     1.0    1.1 10000.0   27.08   49.25   18.61    NO
  1600.   12.80       6     1.0    1.1 10000.0   27.08   52.20   19.34    NO
  1700.   12.52       6     1.0    1.1 10000.0   27.08   55.13   20.05    NO
  1800.   12.21       6     1.0    1.1 10000.0   27.08   58.05   20.75    NO
  1900.   11.87       6     1.0    1.1 10000.0   27.08   60.95   21.44    NO
  2000.   11.53       6     1.0    1.1 10000.0   27.08   63.84   22.11    NO
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
   92.   43.80       6     4.0    4.2 10000.0   12.48    3.80    6.01    SS
```

Attachment 3.1-8: HF Scrub1

```
******  SCREEN3 MODEL  ******
 **** VERSION DATED 96043 ****

ENTER TITLE FOR THIS RUN (UP TO 79 CHARACTERS):
HF_Scrub_1_Uncontrolled

ENTER SOURCE TYPE: P    FOR POINT
                   F    FOR FLARE
                   A    FOR AREA
                   V    FOR VOLUME
  ALSO ENTER ANY OF THE FOLLOWING OPTIONS ON THE SAME LINE:

    N    - TO USE THE NON-REGULATORY BUT CONSERVATIVE BRODE 2
           MIXING HEIGHT OPTION,
    nn.n - TO USE AN ANEMOMETER HEIGHT OTHER THAN THE REGULATORY
           (DEFAULT) 10 METER HEIGHT.
    SS   - TO USE A NON-REGULATORY CAVITY CALCULATION ALTERNATIVE
  Example - PN 7.0 SS (entry for a point source)

 ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:
p
ENTER EMISSION RATE (G/S):
.2583
ENTER STACK HEIGHT (M):
11
ENTER STACK INSIDE DIAMETER (M):
.760
ENTER STACK GAS EXIT VELOCITY OR FLOW RATE:
OPTION 1 : EXIT VELOCITY (M/S):
 DEFAULT - ENTER NUMBER ONLY
OPTION 2 : VOLUME FLOW RATE (M**3/S):
           EXAMPLE "VM=20.00"
OPTION 3 : VOLUME FLOW RATE (ACFM):
           EXAMPLE "VF=1000.00"
vf=12000
ENTER STACK GAS EXIT TEMPERATURE (K):
300
ENTER AMBIENT AIR TEMPERATURE (USE 293 FOR DEFAULT) (K):
293
ENTER RECEPTOR HEIGHT ABOVE GROUND (FOR FLAGPOLE RECEPTOR) (M):
0
ENTER URBAN/RURAL OPTION (U=URBAN, R=RURAL):
r
CONSIDER BUILDING DOWNWASH IN CALCS?  ENTER Y OR N:
y
ENTER BUILDING HEIGHT (M):
9.1
ENTER MINIMUM HORIZ BLDG DIMENSION (M):
50
ENTER MAXIMUM HORIZ BLDG DIMENSION (M):
62
USE COMPLEX TERRAIN SCREEN FOR TERRAIN ABOVE STACK HEIGHT?
ENTER Y OR N:
n
USE SIMPLE TERRAIN SCREEN WITH TERRAIN ABOVE STACK BASE?
ENTER Y OR N:
n
ENTER CHOICE OF METEOROLOGY;
1 - FULL METEOROLOGY (ALL STABILITIES & WIND SPEEDS)
2 - INPUT SINGLE STABILITY CLASS
3 - INPUT SINGLE STABILITY CLASS AND WIND SPEED
1
USE AUTOMATED DISTANCE ARRAY? ENTER Y OR N:
y
ENTER MIN AND MAX DISTANCES TO USE (M):
10,2000

***********************************
*** SCREEN AUTOMATED DISTANCES ***
***********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC          U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)  STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    10.  .4578E-06    6     1.0    1.1 10000.0   29.04    4.30    4.29    NO
   100.   141.7       6     4.0    4.2 10000.0   12.08    4.07    6.72    SS
   200.   73.04       6     4.0    4.2 10000.0   13.78    7.73    8.09    SS
   300.   53.26       6     4.0    4.2 10000.0   14.81   11.23    9.39    SS
   400.   47.52       6     4.0    4.2 10000.0   14.81   14.64   10.64    SS
   500.   41.73       6     3.5    3.7 10000.0   15.54   17.97   11.05    SS
   600.   38.35       6     3.0    3.2 10000.0   16.56   21.24   11.67    SS
   700.   35.77       6     3.0    3.2 10000.0   16.56   24.46   12.69    SS
   800.   33.61       6     2.5    2.6 10000.0   18.02   27.63   13.16    SS
   900.   31.46       6     2.5    2.6 10000.0   18.02   30.78   13.88    SS
  1000.   29.62       6     2.5    2.6 10000.0   18.02   33.88   14.76    SS
  1100.   28.44       6     2.0    2.1 10000.0   20.24   36.96   15.07    SS
  1200.   27.28       6     2.0    2.1 10000.0   20.24   40.01   15.90    SS
  1300.   26.05       6     2.0    2.1 10000.0   20.24   43.04   16.71    SS
  1400.   25.49       6     1.0    1.1 10000.0   29.04   46.33   18.01    NO
  1500.   25.44       6     1.0    1.1 10000.0   29.04   49.30   18.75    NO
  1600.   25.22       6     1.0    1.1 10000.0   29.04   52.25   19.48    NO
  1700.   24.88       6     1.0    1.1 10000.0   29.04   55.18   20.18    NO
  1800.   24.45       6     1.0    1.1 10000.0   29.04   58.10   20.88    NO
  1900.   23.95       6     1.0    1.1 10000.0   29.04   61.00   21.56    NO
  2000.   23.40       6     1.0    1.1 10000.0   29.04   63.88   22.23    NO
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
   92.   147.3       6     4.0    4.2 10000.0   12.08    3.80    6.62    SS
```

Attachment 3.1-9: HF Scrub 3

```
******  SCREEN3 MODEL  ******
 **** VERSION DATED 96043 ****

ENTER TITLE FOR THIS RUN (UP TO 79 CHARACTERS):
HF_Scrub_3_Uncontrolled

ENTER SOURCE TYPE: P    FOR POINT
                   F    FOR FLARE
                   A    FOR AREA
                   V    FOR VOLUME
  ALSO ENTER ANY OF THE FOLLOWING OPTIONS ON THE SAME LINE:

    N    - TO USE THE NON-REGULATORY BUT CONSERVATIVE BRODE 2
           MIXING HEIGHT OPTION,
    nn.n - TO USE AN ANEMOMETER HEIGHT OTHER THAN THE REGULATORY
           (DEFAULT) 10 METER HEIGHT.
    SS   - TO USE A NON-REGULATORY CAVITY CALCULATION ALTERNATIVE
  Example - PN 7.0 SS (entry for a point source)

 ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:
p
ENTER EMISSION RATE (G/S):
.22552
ENTER STACK HEIGHT (M):
11
ENTER STACK INSIDE DIAMETER (M):
.508
ENTER STACK GAS EXIT VELOCITY OR FLOW RATE:
OPTION 1 : EXIT VELOCITY (M/S):
 DEFAULT - ENTER NUMBER ONLY
OPTION 2 : VOLUME FLOW RATE (M**3/S):
           EXAMPLE "VM=20.00"
OPTION 3 : VOLUME FLOW RATE (ACFM):
           EXAMPLE "VF=1000.00"
vf=8500
ENTER STACK GAS EXIT TEMPERATURE (K):
300
ENTER AMBIENT AIR TEMPERATURE (USE 293 FOR DEFAULT) (K):
293
ENTER RECEPTOR HEIGHT ABOVE GROUND (FOR FLAGPOLE RECEPTOR) (M):
0
ENTER URBAN/RURAL OPTION (U=URBAN, R=RURAL):
r
CONSIDER BUILDING DOWNWASH IN CALCS?  ENTER Y OR N:
y
ENTER BUILDING HEIGHT (M):
9.1
ENTER MINIMUM HORIZ BLDG DIMENSION (M):
50
ENTER MAXIMUM HORIZ BLDG DIMENSION (M):
62
USE COMPLEX TERRAIN SCREEN FOR TERRAIN ABOVE STACK HEIGHT?
ENTER Y OR N:
n
USE SIMPLE TERRAIN SCREEN WITH TERRAIN ABOVE STACK BASE?
ENTER Y OR N:
n
ENTER CHOICE OF METEOROLOGY;
1 - FULL METEOROLOGY (ALL STABILITIES & WIND SPEEDS)
2 - INPUT SINGLE STABILITY CLASS
3 - INPUT SINGLE STABILITY CLASS AND WIND SPEED
1
USE AUTOMATED DISTANCE ARRAY? ENTER Y OR N:
y
ENTER MIN AND MAX DISTANCES TO USE (M):
10,2000

***********************************
*** SCREEN AUTOMATED DISTANCES ***
***********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC          U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)  STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    10.  .1016E-03    6     1.0    1.1 10000.0   27.08    4.62    4.61    NO
   100.   85.23       6     4.0    4.2 10000.0   12.48    4.07    6.11    SS
   200.   59.42       6     4.0    4.2 10000.0   13.42    7.73    7.51    SS
   300.   46.07       6     4.0    4.2 10000.0   14.33   11.23    8.84    SS
   400.   42.15       6     4.0    4.2 10000.0   14.33   14.64   10.11    SS
   500.   38.45       6     3.5    3.7 10000.0   15.04   17.97   10.93    SS
   600.   34.14       6     3.0    3.2 10000.0   16.05   21.24   11.18    SS
   700.   32.07       6     3.0    3.2 10000.0   16.05   24.46   12.21    SS
   800.   29.99       6     2.5    2.6 10000.0   17.51   27.63   12.70    SS
   900.   28.51       6     2.5    2.6 10000.0   17.51   30.78   13.68    SS
  1000.   26.63       6     2.5    2.6 10000.0   17.51   33.88   14.38    SS
  1100.   25.69       6     1.0    1.1 10000.0   27.08   37.25   15.52    NO
  1200.   26.15       6     1.0    1.1 10000.0   27.08   40.28   16.32    NO
  1300.   26.25       6     1.0    1.1 10000.0   27.08   43.29   17.10    NO
  1400.   26.11       6     1.0    1.1 10000.0   27.08   46.28   17.86    NO
  1500.   25.77       6     1.0    1.1 10000.0   27.08   49.25   18.61    NO
  1600.   25.31       6     1.0    1.1 10000.0   27.08   52.20   19.34    NO
  1700.   24.75       6     1.0    1.1 10000.0   27.08   55.13   20.05    NO
  1800.   24.13       6     1.0    1.1 10000.0   27.08   58.05   20.75    NO
  1900.   23.47       6     1.0    1.1 10000.0   27.08   60.95   21.44    NO
  2000.   22.79       6     1.0    1.1 10000.0   27.08   63.84   22.11    NO
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
   92.   86.56       6     4.0    4.2 10000.0   12.48    3.80    6.01    SS
```

Attachment 3.1-10: NHO_3 Scrub3

```
******  SCREEN3 MODEL  ******
 **** VERSION DATED 96043 ****

ENTER TITLE FOR THIS RUN (UP TO 79 CHARACTERS):
NHO3 Scrub3

ENTER SOURCE TYPE: P    FOR POINT
                   F    FOR FLARE
                   A    FOR AREA
                   V    FOR VOLUME
  ALSO ENTER ANY OF THE FOLLOWING OPTIONS ON THE SAME LINE:

    N    - TO USE THE NON-REGULATORY BUT CONSERVATIVE BRODE 2
           MIXING HEIGHT OPTION,
    nn.n - TO USE AN ANEMOMETER HEIGHT OTHER THAN THE REGULATORY
           (DEFAULT) 10 METER HEIGHT.
    SS   - TO USE A NON-REGULATORY CAVITY CALCULATION ALTERNATIVE
  Example - PN 7.0 SS (entry for a point source)

 ENTER SOURCE TYPE AND ANY OF THE ABOVE OPTIONS:
p
ENTER EMISSION RATE (G/S):
.1545
ENTER STACK HEIGHT (M):
11
ENTER STACK INSIDE DIAMETER (M):
.508
ENTER STACK GAS EXIT VELOCITY OR FLOW RATE:
OPTION 1 : EXIT VELOCITY (M/S):
 DEFAULT - ENTER NUMBER ONLY
OPTION 2 : VOLUME FLOW RATE (M**3/S):
           EXAMPLE "VM=20.00"
OPTION 3 : VOLUME FLOW RATE (ACFM):
           EXAMPLE "VF=1000.00"
vf=8500
ENTER STACK GAS EXIT TEMPERATURE (K):
300
ENTER AMBIENT AIR TEMPERATURE (USE 293 FOR DEFAULT) (K):
293
ENTER RECEPTOR HEIGHT ABOVE GROUND (FOR FLAGPOLE RECEPTOR) (M):
0
ENTER URBAN/RURAL OPTION (U=URBAN, R=RURAL):
r
CONSIDER BUILDING DOWNWASH IN CALCS?  ENTER Y OR N:
y
ENTER BUILDING HEIGHT (M):
9.1
ENTER MINIMUM HORIZ BLDG DIMENSION (M):
50
ENTER MAXIMUM HORIZ BLDG DIMENSION (M):
62
USE COMPLEX TERRAIN SCREEN FOR TERRAIN ABOVE STACK HEIGHT?
ENTER Y OR N:
n
USE SIMPLE TERRAIN SCREEN WITH TERRAIN ABOVE STACK BASE?
ENTER Y OR N:
n
ENTER CHOICE OF METEOROLOGY;
1 - FULL METEOROLOGY (ALL STABILITIES & WIND SPEEDS)
2 - INPUT SINGLE STABILITY CLASS
3 - INPUT SINGLE STABILITY CLASS AND WIND SPEED
1
USE AUTOMATED DISTANCE ARRAY? ENTER Y OR N:
y
ENTER MIN AND MAX DISTANCES TO USE (M):
10, 2000

***********************************
*** SCREEN AUTOMATED DISTANCES ***
***********************************

*** TERRAIN HEIGHT OF    0. M ABOVE STACK BASE USED FOR FOLLOWING DISTANCES ***

  DIST     CONC          U10M   USTK  MIX HT   PLUME   SIGMA   SIGMA
   (M)   (UG/M**3)  STAB  (M/S)  (M/S)    (M)   HT (M)   Y (M)   Z (M)  DWASH
-------  ----------  ----  -----  -----  ------  ------  ------  ------  -----
    10.  .6959E-04    6     1.0    1.1 10000.0   27.08    4.62    4.61    NO
   100.   58.39       6     4.0    4.2 10000.0   12.48    4.07    6.11    SS
   200.   40.71       6     4.0    4.2 10000.0   13.42    7.73    7.51    SS
   300.   31.56       6     4.0    4.2 10000.0   14.33   11.23    8.84    SS
   400.   28.88       6     4.0    4.2 10000.0   14.33   14.64   10.11    SS
   500.   26.34       6     3.5    3.7 10000.0   15.04   17.97   10.93    SS
   600.   23.39       6     3.0    3.2 10000.0   16.05   21.24   11.18    SS
   700.   21.97       6     3.0    3.2 10000.0   16.05   24.46   12.21    SS
   800.   20.55       6     2.5    2.6 10000.0   17.51   27.63   12.70    SS
   900.   19.54       6     2.5    2.6 10000.0   17.51   30.78   13.68    SS
  1000.   18.25       6     2.5    2.6 10000.0   17.51   33.88   14.38    SS
  1100.   17.60       6     1.0    1.1 10000.0   27.08   37.25   15.52    NO
  1200.   17.91       6     1.0    1.1 10000.0   27.08   40.28   16.32    NO
  1300.   17.99       6     1.0    1.1 10000.0   27.08   43.29   17.10    NO
  1400.   17.89       6     1.0    1.1 10000.0   27.08   46.28   17.86    NO
  1500.   17.66       6     1.0    1.1 10000.0   27.08   49.25   18.61    NO
  1600.   17.34       6     1.0    1.1 10000.0   27.08   52.20   19.34    NO
  1700.   16.95       6     1.0    1.1 10000.0   27.08   55.13   20.05    NO
  1800.   16.53       6     1.0    1.1 10000.0   27.08   58.05   20.75    NO
  1900.   16.08       6     1.0    1.1 10000.0   27.08   60.95   21.44    NO
  2000.   15.61       6     1.0    1.1 10000.0   27.08   63.84   22.11    NO
ITERATING TO FIND MAXIMUM CONCENTRATION . . .

MAXIMUM 1-HR CONCENTRATION AT OR BEYOND    10. M:
   92.   59.30       6     4.0    4.2 10000.0   12.48    3.80    6.01    SS
```

ATTACHMENT "C": EQUIPMENT LIST

EQUIPMENT TYPE & ID NUMBER	MAX CAPACITY	MAKE	MODEL	SERIAL NUMBER	INSTALL/ MFG DATE
Boiler B-1	1.919 MMBtu/hr	Raypak	H7-2005A	1310365652	2013
Emergency Generator EDG-1	250 hp	Detroit Diesel	GA250 / 78.6L / Series 40	WG1308N1082857	1997
Fume Scrubbers					
Fume Scrubber SC-1	12,000 cfm	WESCO	H55-4QM FRP	01981200055H	1998
Fume Scrubber SC-2	2,000 cfm	Harrington/ Viron	ECH 2 3-5 LB	S-012899-1	1999
Fume Scrubber SC-3	8,500 cfm	Harrington/ Viron	VCB-1127-BD-FRP	11460	1996
Process Equipment					
Strip & Etch Bench #1	4500 cfm	UltraFab	NA	10267-A	1998
Strip & Etch Bench #2	1620 cfm	UltraFab	NA	10395	1998
Strip & Etch Bench #3	1155 cfm	UltraFab	NA	10267-C	1998
Strip & Etch Bench #4	550 cfm	Amerimade	NA	NA	2019 (I)
PWC Clean Bench	2800 cfm	Ultra Fab	NA	10267-B	1998
FCD Clean Bench	550 cfm	Ultra Fab	UFT-82D	NA	1997
SPEC Clean Bench	3635 cfm	SPEC	SBXALT-19-90	6429 MOD 4	2007
TEL Clean Bench	1380 cfm	TEL	UW300Z	W033089	2017
DSP Wafer Cleaning Bench	550 cfm	Ultra Fab	Clean	14761	1997
Spin Rinse Dryers (x3)	Negative Pressure	Verteq (x2) Semitool	NA ASC-101	NA NA	1997
Wafer Scrubbers (x6)	Negative Pressure	Ontrak (x5) SVG	DSS-200 NA	10472 NA	1997

EQUIPMENT TYPE & ID NUMBER	MAX CAPACITY	MAKE	MODEL	SERIAL NUMBER	INSTALL/ MFG DATE
Acid Waste Neutralization System Acid Holding Tanks	Closed Vented Tanks Negative Pressure 500 gallons 200 gallons (x2)	NA	NA	NA	1997
Chemical Dispensing Cabinets (x13)	Negative Pressure	Control Engineering	Standard Dispense Cabinet	NA	1997